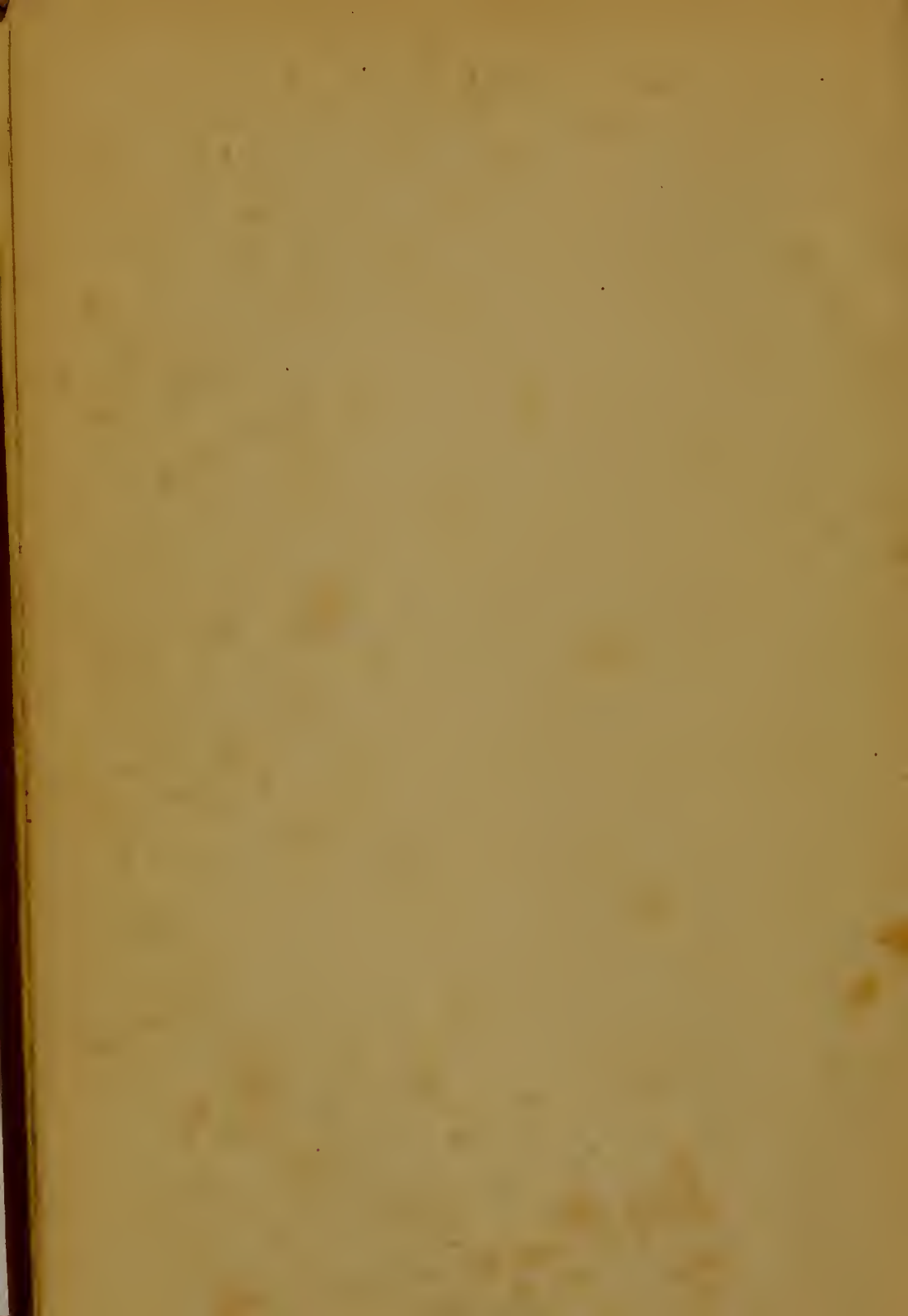


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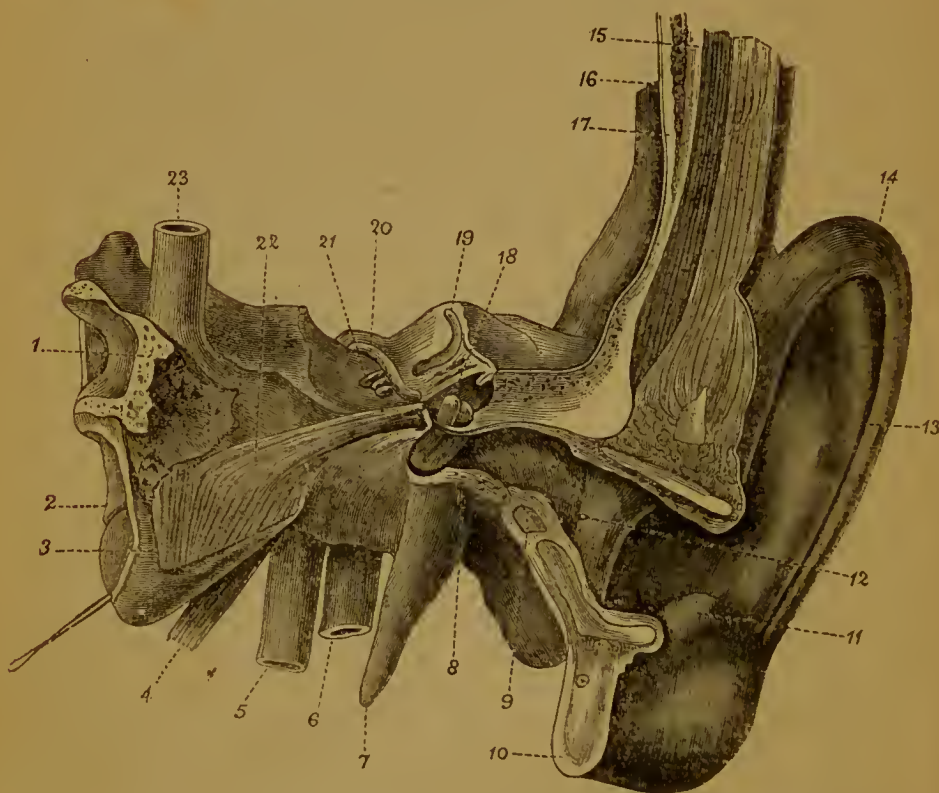
AURAL SURGERY





TOPOGRAPHICAL REPRESENTATION OF THE ENTIRE AUDITORY APPARATUS (LEFT EAR).

This Plate is after Tröltzsch, vide Tröltzsch on "Surgical Diseases of the Ear," translated by Linton.—*New Sydenham Society, 1874.*



1. Section of the body of the sphenoid bone. 2. Recessus pharyngis or Rosenmüller's fossa, between which and a sound introduced into the commencement of the cartilaginous Eustachian tube projects the posterior cartilaginous lip of the pharyngeal mouth of the tube. 3. *Tensor palati* or *sphenopalpingo-staphylinus* (abductor or dilator of the Eustachian tube). 4. *Levator palati* or *petrosalpingo-staphylinus*. Between the two divided muscels a portion of the membranous part of the cartilaginous Eustachian tube. 5 and 23. Internal carotid artery, before and after its passage through the petrous bone. 6. Internal jugular vein. 7. Styloid process. 8. Section of osseous meatus. At the end of the latter the external surface of the membrana tympani is seen. 9. Section of cartilaginous meatus. 10. Lobule of the ear. 11. *Antitragus*. 12. External orifice of ear, commencement of meatus, the interior wall of which, with the tragus, has been taken away. 13. *Anthelix* or opposite rim, passing below or into *antitragus*. 14. *Helix* or rim of the ear. 15. Temporal muscle. 16. Dura mater, lining the temporal bone externally. 17. Squamous portion of temporal bone. 18. Head of the malleus, near and behind it the body of the incus; above it the osseous roof of the tympanum, with its hollow spaces, and covered by dura mater. 19. Inferior semicircular canal, partly laid open, with one entrance to the vestibule. 20. Facial nerve, from the internal meatus, as far as its knee-shaped curve. 21. Cochlea, partly laid open. 22. *Tensor tympani* muscle (*Trommelfell-spanner*), passing along and above the laid open osseous Eustachian tube, and giving off superiorly its tendon, which passes transversely across the tympanum.

A TREATISE ON AURAL SURGERY

BY

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FOR WOMEN AND CHILDREN AND THE CORK MATERNITY

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TO THE MEMORY OF

THE LATE JAMES HINTON

AS A HUMBLE TRIBUTE TO

HIS GENIUS, TALENTS, AND WORTH,

THIS TREATISE IS DEDICATED,

BY ONE WHO, FOR SEVERAL YEARS, RECEIVED MANY KINDNESSES

AT HIS HANDS.

P R E F A C E.

THE success which attended the first edition of this treatise has necessitated a second. I have endeavoured to correct the imperfections that existed in the former and have considerably enlarged the latter. The entire book is re-arranged, and, I may say, rewritten. I have added several chapters, and tried to bring the book up to the present standard of aural therapeutics. I have maintained, so far as I possibly could, the essentially practical character of the work.

I have to thank Dr Weber Liel of Berlin, and Dr Löwenberg of Paris, for a careful perusal of the previous edition, as well as for many useful hints and suggestions. To both these distinguished aural surgeons I am indebted for the trouble they have taken in sending me new material in the special fields of aural therapeutics in which they have so successfully laboured.

The series of papers which I published in the "Medical Press and Circular," the translation of Dr Löwenberg's work on "Adenoid Tumours in the Nasopharynx," I have condensed and added in the form of a special chapter by his permission. Dr Weber Liel has revised the chapter on tenotomy of the tensor tympani. Dr Morell Mackenzie has written a small

addition to the portions bearing on the throat in the chapters on rhinoscopy, enlarged tonsils, and post-nasal catarrh. To Dr Turnbull of Philadelphia, also, I am indebted for several practical hints on tinnitus aurium, the education of the deaf-mute, and the influence of sea-bathing in causing deafness.

Dr Ringrose Atkins has rewritten the chapter on othæmatoma. To many other workers I am under obligation for assistance or for valuable papers sent to me, more particularly Mr Field of St Mary's, Dr Woakes, Dr Lennox Browne, Dr J. Patterson Cassells, Dr Burnett (Philadelphia), Dr Charles Turnbull, and to several others whose writings are referred to in the following pages.

I may here say that the experience on which this treatise is based has been derived from the examination and treatment of upwards of 5000 aural patients.

I cannot place this edition before the profession without acknowledging the too generous reception accorded to my first effort, as also to the "Atlas" which followed. I shall be more than repaid should a like approval be given to the present work.

H. MACNAUGHTON JONES.

ST PATRICK'S PLACE, CORK,
November 1881.

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AURAL SURGERY.

CHAPTER I.

INTRODUCTION.

MANY years have gone by since Sir William Wilde drew attention to the general vagueness which exists amongst medical men on the subject of Aural disease. Yet to the present day how few medical men do we find who do not view interference with any aural complication, save the simple blocking-up of the meatus with cerumen, as "meddlesome" and dangerous? How constantly do we hear physicians, well informed on other matters, speak of any interference with the ear as "poking" and "meddling!" The cause of this is not far to seek. To the same source of ignorance is attributable the want of knowledge of ophthalmic and laryngeal affections. The teaching of all the three organs—eye, ear, and throat—is too much neglected in the schools generally: an accurate knowledge of their diseases and pathology is not sufficiently insisted on. Students are satisfied with the most superficial idea of these special branches. Certainly, in this respect, the term "speciality" is an unfortunate one. Most students view what they are pleased to regard, and are taught to

look on, as special studies, as outside the pale of general surgery. They calculate that at most a question or two in an examination is all that they have to fear. They know that most examiners in general surgery are themselves devoid of an accurate special knowledge of these branches. Hence comes neglect in the study of them, and the deplorable result that yearly the great majority of men are obtaining qualifications to practise who are totally ignorant of the advances which have been made in recent years in the diagnosis and treatment of the diseases of three of the most important organs in the body.

The remedy is simple and obvious. Students should be taught practically the stress which the examining bodies lay on a sufficient study of these parts. They can only be brought to feel this by a practical examination in all three branches before they obtain their licence. This would speedily cause a greater interest in, and result in a more diffused knowledge of these subjects. We should not then, as is now frequently the case, meet men starting in practice who have never seen an ophthalmoscope, never looked through an aural speculum, and have never applied a laryngoscopic mirror.

To return to the particular organ under discussion, it is my object in these remarks to furnish the student and general practitioner with some brief, but practical, hints on the diagnosis and treatment of aural affections. The many valuable treatises now published on the ear are, of course, replete with information on this branch of surgery; but from several years' experience, and from constant consultation with

medical men, I find that such are not carefully or widely read, and hardly at all by students. Hence, through the medium of these pages some concise rules for practice, and useful hints on treatment, may be acceptable both to the practitioner and student. In order to do this I shall endeavour to make these observations as simple as possible, and deal principally with those diseases of every-day occurrence, for the treatment of which, all practitioners are being constantly consulted. It will not be necessary for this purpose to enter into vexed questions as yet unsettled, but simply to point out the leading principles which should guide the surgeon in arriving at a quick and safe diagnosis in any aural case. Nor is it necessary to distract attention by repeated reference to authorities. The mode of examination which I follow and detail is that usually pursued by aural surgeons; but more especially is that line of practice recommended which was adopted by unquestionably the leading English aurist since Toynbee's death, the late James Hinton. His zeal in the cause of aural surgery, and his anxiety for the spread of knowledge in this department, have attracted many to labour in this field. It was through the same disinterested kindness on the part of Mr Hinton that I was, many years since, first brought to take an interest in aural surgery, and to feel, in his own words, "that very few fields of practice afford subjects of greater interest to study, or give a larger reward to the exercise of skill."

Those who desire a more extended knowledge of the subject I would refer to the works and papers of Hinton, especially his "Questions of Aural Surgery,"

published in 1874, and those of Toynbee, Von Tröltsch, Dalby, St John Roosa, Politzer, Burnett, Turnbull, and others.

It is not within the design of this work to devote space to the anatomy of the organ. Those who are deficient in knowledge on this point had better make good their deficiency before they attempt the treatment of affections of the middle and internal ear. This, however, they can readily do from any standard work on anatomy, in which study they will be materially assisted by models, and the prepared sections of the petrous portion of the temporal bone:—(1) The section showing the meatus, membrana tympani, ossicles, and middle ear; (2) the section showing the cavity of the tympanum, and its openings; the internal ear with its semicircular canals, the cochlea, and the various orifices. (These temporal bones may be obtained from Messrs Matthews, of London, and will be found extremely useful aids in the study of the anatomy of the ear.) The plates of Professor Dr Adam Politzer are those that I use myself in giving clinical instruction.

It is necessary in many cases to combine the treatment of the nasal passages and throat with that for affections of the ear. This frequently happens, and therefore the aural surgeon must have some special apparatus for the exploration of the nose, the posterior nasal orifices, and the throat. In fact, when we reflect on the large percentage of cases of deafness caused by unhealthy states of the throat, it is apparent that one of the main points in the successful management of such is, to see carefully to and correct any morbid state of the latter.

It may be well here to mention, in order, the apparatus which it is essential should be possessed by all who wish successfully to diagnose affections of the ear:—

Bull's eye argand burner, and universal bracket (same as that used for the laryngoscope).

Laryngoscope reflector, with spectacle frame, or on handle.

Double otoscope.

Aural specula (three sizes), or Brunton's auriscope.

Tuning-forks (different keys).

Pneumatic speculum.

Eustachian catheters (different sizes).

Two of Noyes' catheters (right and left).

Bougies.

Politzer's bags.

Ear syringes.

Small syringe for Eustachian catheter.

Ear forceps; lever ring and rectangular (various kinds).

Knife for incising membrane (myringotome).

Jones' aural probe.

Turnbull's Eustachian forceps.

Snares for polypus.

Rheophore. (Galvanisation of membrane.)

Artificial membranes.

Absorbent cotton wool.

Tongue depressor.

Nasal specula.

Nasal douches (siphon and bag).

Laryngeal mirrors.

Mirror for rhinoscopy.

Laryngeal brushes.

Mackenzie's tonsil guillotine (two sizes).

Though this to some may appear a formidable list, it must be remembered that it includes most of the instruments requisite, not alone for diagnosis, but also for the treatment of any aural affection, certainly most that would be required in ordinary practice.

With a speculum and mirror, tuning-fork, otoscope, Eustachian catheter, and Politzer's bag, the great majority of aural lesions may be diagnosed with comparative certainty. The remaining instruments are not so much diagnostic as therapeutical, and for the purpose of treatment. We shall consider the method of employment of, and the most improved form of these and other instruments as we are dealing with the various states necessitating their use. We now pass to the best plan of examination, and the steps, in consecutive order, which it is necessary to take in proceeding to form a diagnosis.

CHAPTER II.

STEPS OF EXAMINATION—HISTORY—SYMPTOMS, ETC.

The following brief method of examination is that which I usually adopt:—

History of Case, including—

Causes.

Hereditary influences.

Past treatment.

Present Symptoms, including—

Tinnitus.

Pain.

Discharge.

Evidence of constitutional taint.

Hearing distance—watch, click of finger nails, voice.

External meatus (condition of).

Membrana tympani (condition of), with cavity of tympanum.

Tuning-fork.

Eustachian tube (state of).

Throat (state of).

Nose (state of).

This can be done in tabular form thus:—

No. of Case—Name—Age.

History, &c.

Symptoms.

	Right ear.	Left.
HD	”	”
EM	”	”
M and TC	”	”
TF	”	”
ET	”	”
Throat.		
Nose.		

Examination.—Having ascertained the general state of health of the patient, the first step is to inquire into the length of time the deafness has lasted, if both ears are affected, and if so, the manner in which each has been attacked; next to note carefully the manner in which the deafness has progressed, if this progress has been rapid or insidious, with or without pain or discharge. The careful examination and comparison of the hearing power of the two ears is requisite in every instance. Patients constantly affirm that the hearing of one ear is perfect, yet on coming to test it accurately we may find it more or less impaired, the reason of this being that while the conversational power is not interfered with, the hearing distance as measured by the watch is considerably so. We should now seek closely for some cause, making inquiries into the habits, occupation, state of health at the time of, or preceding the invasion of the symptoms. The connection of deafness with the exanthemata is a point which should not here be overlooked, these and the various fevers being frequent causes of deafness. Cold, rheumatism, gout, and syphilis should not be forgotten, the last two particularly, both as a direct and hereditary source of mischief.

Tinnitus.—The occurrence of tinnitus is not a constant symptom. We should inquire then carefully into the history of the noises, if any such be heard, how and when they commenced, their nature, if they have increased of late, if they are periodical or liable to exacerbations. Tinnitus may be caused by almost any abnormal state of the meatus, membrane, middle ear, labyrinth, or Eustachian tube, and therefore it is valuable as a

diagnostic sign, and in forming a prognosis, when taken in conjunction with other symptoms and appearances. The most frequent causes of deafness in the external meatus met with in general practice are cerumen, eczema, foreign bodies, abscess, exostosis, aspergillus, polypus. It is surprising the minute portion of cerumen which, if it rests on the membrane, will produce this unpleasant complication. This week I was consulted by a gentleman for noises in the ear; the hearing power was normal, and on examination I found the membrane healthy, and the only discernible cause of the annoyance was a small collection of cerumen which lay close to the membrane, and which perhaps had been pushed further in by that most reprehensible of all practices, namely, attempts to clear out the ear with pieces of rolled paper, or the end of a towel, &c. On gently syringing out the ear I removed with the small atom of cerumen a hay seed, which had escaped my notice, lying, as it did, flat against the wall of the meatus. It is difficult to isolate those states of the membrane itself, which cause tinnitus, for nearly all its abnormal appearances and positions, as increased concavity, dulness, thickening, want of mobility, are secondary results due to faults pre-existing in either the cavity of the tympanum or in the Eustachian tube. The fact that there is a large number of cases in which relief is given when air is forced into the cavity of the tympanum by Politzer's air bag, and the membrane's position temporarily restored, or when the tension is lessened by the suction through a tube placed in the external meatus or by the pneumatic speculum, proves the practical importance of noting the position and appear-

ance of the membrane in all such cases. We shall have occasion subsequently to consider the effect of spasm of the tensor tympani or chronic contraction of this muscle in producing permanent alteration in the appearance of the membrane, and frequently incurable tinnitus.

Perhaps of all the causes of tinnitus there is no one so frequent as that of mucus in the cavity of the tympanum. The diagnosis of this condition we will consider presently. It is frequently accompanied by closure or obstruction of the Eustachian tube. The occurrence of tinnitus during ordinary catarrh in the head when the nasal mucous membrane and that lining the faucial orifice of the tube is congested, proves how slight a cause will give rise to this symptom if there is any obstruction to the passage of air or fluid through the natural outlet. Excluding causes existing in the external meatus, the membrane and cavity of the tympanum, and the Eustachian tube, we have to deal with a large class of cases in which the cause is in the labyrinth, the semicircular canals, or cochlea.

Many of these cases have a distinct train of symptoms described so accurately by Menière under the head of "labyrinthine vertigo." The most usual attendants are giddiness, tendency to fall to either side, staggering gait, occasional vomiting, and various degrees of tinnitus. Such symptoms may undoubtedly be produced by other disordered states than those taking their origin in the labyrinth, and may be secondary from the results of disease in the tympanum, or any cause producing labyrinthine pressure. For example, in those cases in which relief is afforded, and the noise disappears on suction with a tube in the meatus, the cause may be, as pointed

out by Mr Hinton, muscular, and the stapedius and tensor tympani are in a state of spasmodic contraction.

There is at present a man, aged forty-eight, attending the hospital, who came on the 20th of October 1876, with the following symptoms:—He for some time past had, as he described it, “a reeling in his head.” His gait was staggering, he had to place his hand against the wall to support himself. He was, he said, “more like a drunken man,” and on his way to the hospital, to which he was assisted by his wife, he thought that he should have been taken for one. He had musical sounds in the left ear. He did not hear the watch on contact in this ear. He had great pain, and had not slept for ten nights previous to his visit. He looked worn and pallid. His tongue was coated with a creamy fur, and he had a difficulty in retaining any food on his stomach. On examining the meatus, I found the orifice occluded with discharge, on washing which out I discovered a large fibroid mass filling up the meatus, quite unlike an ordinary polypus. On closer examination, I found that this sprung from the tympanum. The hearing of the other ear was normal, and the appearance of the membrane healthy. There were no noises in it. I snared the growth as well as I could, and brought away the greater part of the mass. I gave him twenty grain doses of bromide of potassium, vesicated him freely over the mastoid process, and regulated his diet. The meatus was considerably swollen and narrowed. From this until the 27th I kept the meatus clear, cleaning it out daily, and removing the small remaining portion of the polypoid growth with the lever ring or rectangular forceps, and making him continue the bromide of potassium. On this

date I have a note that the "reeling is much better, sleeps well at night." On walking, he still had to place the hands to the wall, and his wife led him to hospital. I now touched the remaining granulations with chloroacetic acid and chromic acid alternately. On the 3d November the pain was much less, the meatus was still considerably contracted; it was cleaned out every second day; the noises were much less, and his gait was improved; there was great pallor and debility. I now gave him thirty drop doses of the muriated tincture of iron. On the 17th of November I reverted to the bromide of potassium. The treatment has been much the same since that date. A twenty-grain solution of nitrate of silver has been occasionally used to the membrane and meatus. All the mass has been removed or destroyed. He has returned to his work. His gait is perfect, he comes to the hospital regularly, there is no pain, the discharge has nearly ceased; there is still does not hear in the ear, but the tinnitus has gone; there is a large perforation of the membrane, all pulsation in which has ceased for the past week. In this case there can be little doubt that all these formidable symptoms were caused by pressure, conveyed to the labyrinth by the fibroid mass, which destroyed the membrane, and encroached on the tympanic cavity.

There are, however, constantly occurring cases in which the tinnitus depends on no assigned cause, if we except the ambiguous class of "nervine." Deafness in such is not a necessary attendant. The only symptom complained of is the constant noise. These cases I find are as a rule incurable, and resist any form of treatment. On examination the membrane is usually

healthy, there is no abnormal sound heard with the otoscope, the throat and faucial orifice of the Eustachian tube are healthy, the deafness may be slight and conversational power not in the least affected, yet the tinnitus is intolerable. Some of these date the origin of their trouble to nervous shock, some to the occurrence of fever, the administration of medicine, climatic influences, as residence in India. The sole clue to the mischief usually obtainable is by means of the tuning-fork, which only yields negative results. No good that I am aware of can be effected by any local treatment when such a state supervenes.

That quinine produces analogous symptoms in some persons to labyrinthine vertigo is well known. Though I have in the Cork Fever Hospital, and in private practice constantly administered quinine in remittent fever, and as an antipyretic in ten to fifteen grain doses, as often as every third hour, producing at times headache, tinnitus, and vomiting, I have never known any permanent effects from its administration.

Many years since, while making some experiments in which I was assisted by the late Professor Blyth, I gave a healthy man, a pensioner, thirty grains of quinia (the alkaloid) for the purpose of estimating the total amount of quinia excreted by the kidneys for twenty-four hours subsequently. This man suffered for a considerable time from tinnitus and partial deafness, this continuing for nearly twelve months, gradually becoming less. He died eventually several years later from the effects of alcohol. The tinnitus and deafness never completely deserted him.

I am aware of a case in which the reeling and

staggering gait produced by quinine, simulating those symptoms present in labyrinthine vertigo, has been mistaken for drunkenness, with most unpleasant consequences to the sufferer. In inquiring into the origin of tinnitus we must not forget such causes as exposure to cold, bathing, nervous shock, general debility, hysterical temperament, mental excitement and worry, overstrain at business, general depression of spirits, exposure in open boats, the effects of gunnery experiments, and blows on the ear.

It is most important to look to the rhythmic nature of the noises. I have known many cases of vascular tinnitus consequent on over mental strain. It is in these cases of general vascular tension with vasomotor disturbance that we find such benefit from the administration of the bromides of potassium and zinc, hydrobromic acid, nitrite of amyl. But most readily are these patients relieved and permanently cured by rest and change of air. A trip through Switzerland, or a sea voyage, will frequently dissipate the trouble which has been persistent for months.

A few years since, for a period of eighteen months, I was annoyed by a tinnitus and pulsation in my left ear, that commenced regularly on laying my head on the pillow at night, keeping me awake, and which was also present for a short time after I awoke in the morning. It generally disappeared completely in the day time. The noise could be temporarily arrested by strong pressure on the mastoid and over the styloid process. The sound was of a cooing character, always rhythmical, giving the exact idea of an aneurysmal bruit. I found, on carefully watching my diet, that

alcohol of any kind, and tea, always accentuated the noises. The influence of the former was quite remarkable. These noises have now altogether disappeared. A trip through Switzerland, the total abandonment of tea and alcohol for a time cured me. All through the time these noises lasted I was in a low state of health. In Dickens' language, I felt "giddy, jarred, uncertain shaken," from great physical and mental strain. The complete abstinence from alcohol and tea I have since found in the case of others similarly attacked to be attended by the happiest results. If a wine is taken, good claret is the best. Thorough attention to the secretions, some mineral acid and vegetable tonic—strychnia—Dusart's syrup of the hypophosphates of iron and lime, maltine, with lactopeptine or liq. pepticus at meals, and, if there be a gouty tendency, the effervescing salicylate of lithia are amongst the best remedies to adopt. For myself I sometimes found relief from changing the side on which I was in the habit of lying when asleep, the more so by lying on the opposite side to that at which the noises were most heard. But for such tinnitus, mental rest and change of air and scene are the best remedies.

As far back as 1873 Dr Weber Liel divided chronic affections of the ear into two great groups, those in which tinnitus was present and those in which it was absent. In the former the tendency always is to a progressive deafness, and in these cases the disturbance of equilibrium is to be sought for in the muscular apparatus of the middle ear, while the primary trouble exists in some defect in innervation. Dr Weber Liel looks on paresis of the tensor veli as a starting-point in

many of those cases of tinnitus. The paralysis of this muscle influences the Eustachian tube causing collapse of its walls and permits of an abnormal contraction of the tensor tympani muscle, and hence from this combined cause arises intra-tympanic and intra-labyrinthine disturbances, which affect both the circulation and nutrition of the tympanum and labyrinth. It is easy to perceive how chronic catarrhal conditions, abnormal states of tension of the membrana tympani, fixation of the ossicles, hyperæmic, anæmic, and exudative changes follow. More particularly is this the consequence if there be superadded a gouty, rheumatic, or syphilitic diathesis. It is during these periods of impaired innervation that tinnitus is apt to occur. The accompanying neurosis in the pharynx and larynx clearly points to the real origin of the tinnitus. The palate muscles and the abductors and adductors of the vocal cords participate in the trouble. There is hoarseness or want of power to speak for any length of time, the voice is quickly tired, the patient cannot sing the high notes. And as in the ear so in the larynx.

I have frequently examined the larynx of patients suffering as described above, and with the paresis there is an accompanying hyperæmia of the vocal cords. In such cases we find great good effected, if not complete relief from the tinnitus and accompanying vocal troubles, by change of air, rest from work and worry, a tonic regimen, avoidance of stimulants, the use of the air donche, and electrification of the tubal muscles or intratubular electrification in the manner first recommended by Dr Weber Liel. He believes also that the internal

pterygoid plays an important part in the production of tinnitus through its action on the Eustachian tube, and thus indirectly on the tensor tympani.

I have had a patient in whom troublesome tinnitus has been produced by snuff which had entered the Eustachian tube and the cavity of the tympanum, the tinnitus being removed on washing out the cavity of the tympanum and clearing the tube. Women during the menopause in consequence of congestive hæmorrhages, young girls with irregularities of menstruation, and attendant general hyperæmic or anæmic states, especially those who are the victims of severe neuralgia, are frequently attacked by troublesome tinnitus. In children deafness with tinnitus may be caused by adenoid growths, nasal and post-nasal catarrh, the exanthemata, whooping-cough, mumps, and worms. Morbid states of the general system dependent on diseases of the heart, kidneys, and liver are frequently accompanied by tinnitus. The changed and rigid arterial coats which are the result of renal disease may, when their calibre is narrowed, as pointed out by Dr Jago, produce tinnitus. So also tumours in the cervical region, alterations of the blood-current in the carotid or basilar arteries, an aneurismal condition of these vessels, or disease in their coats, may be the source of this symptom. The over-indulgence in alcohol or tobacco may give rise to it. The importance of the abuse of tobacco in causing deafness is, I believe, frequently overlooked. I have had many cases of deafness without apparent pathological changes in confirmed smokers, in which, when the habit was relinquished, considerable and permanent improvement has taken place. Turnbull, in his treatise on

"Tinnitus Aurium," makes reference to the association which exists between the advent of the noises and insanity.

It would appear that, as Tröltsch has said, there is a "nervous tinnitus aurium" and a "material or acoustic which may exist at the same time"—a double set of hallucinations, one distinctly aural, the other cerebral. Schwartz's opinion, quoted by Turnbull, however, is most important—"Subjective aural sensations, which are caused by demonstrable affections of the ear, may, in predisposed persons, especially when there is hereditary tendency to mental disease, become the direct cause of aural hallucination, that may accelerate the outbreak of mental disease." Any one who has seen the distress caused to some by the unceasing roar in the head, and heard their declaration that "the noises would drive them insane if not relieved," must recognise the importance in all those cases where aural tinnitus accompanies mental hallucination, of making a careful examination of the ear. Certainly there can be no doubt that such aural complication may accelerate and increase the mental affection.

As regards the character of tinnitus, I do not find that this, as a rule, makes much practical difference. Habits and occupation may have a tendency to develop this, as, for instance, in persons who are subject to constant noises, as telegraph operatives, boiler makers, or workers in machinery. I have usually found that the milder and more removable symptoms are described as a "buzzing" or "singing," such as when cerumen is present, or a foreign body in the meatus. A "drumming" in the ear I have noticed frequently, with

temporary closure of the Eustachian tube. In a gentleman with old tympanic mischief and evidence of nervine impairment, the chief thing complained of was the occasional fancy that he heard persons addressing him, causing him to turn round to discover who was speaking to him. This hallucination of voices in the ears is, in my experience, not common. I have myself, when overworked and dyspeptic, suffered for days from an unpleasant knocking in the ear coming on at intervals, a state which I am in the habit of relieving occasionally by a powerful inflation of the membrane. Mr Hinton drew attention to the value in a diagnostic point of view of the musical nature of the sound in cases of nervine deafness. This accords with my own experience. But I have more frequently found a loud roaring or rushing noise complained of in those cases where the deafness was slight, and in which the tinnitus yielded to no treatment, and where no abnormal state, recognisable, save with the tuning-fork, existed to account for it. I have come to look on these musical sounds, and those likened to the roaring or rushing of water, as the most unfavourable in a prognostic point of view. Dr Turnbull has had special experience in the use of hydrobromic ether, administered both by the mouth and also as an intra-tympanal injection vapour in tinnitus; more especially does he use it in cases where the noises are of a functional and nervous character. I have many times given it in the form advised by him:—

R	Ether Hydrobromic	.	.	.	.	mxx
	Glycerine	.	.	.	.	f 3 ss
	Acacia Pulv.	.	.	.	.	3 ij
	Aq. font.	.	.	.	.	f 3 ss

Sig.: f 3j ter diem.

I cannot say that I can speak more highly of it than of the other remedies of its class. Its application, when mixed with glycerine and water, as a local sedative in painful states, accompanying the formation of abscess and other inflammatory or neuralgic conditions, has been attended often by relief from pain.

CHAPTER III.

STEPS OF EXAMINATION—HISTORY—SYMPTOMS, ETC.—
continued.

Hereditary Influences.—The history of deafness in the family should be especially inquired into in those cases where the difficulty of hearing comes on without any assignable cause, and where there is no marked abnormal condition to account for the malady. That deafness “runs in” certain families is well known, and this hereditary tendency (apart from such affections as gout and syphilis) will throw light on many cases in which the cause is obscure. I have just at present a lady under my care who is very deaf, and whose mind is beginning to fail. She is one of a family, two other members of which are deaf. Deafness has been transmitted for generations; and, coincident with the deafness, there is also a family history of insanity.

Gout.—Gout is perhaps the most mischievous heirloom. It may produce its effects at any age, and these are often most insidious, but those cases that I have seen were all over the age of thirty. I have noticed the coincidence of exostoses of the external meatus frequently in gouty patients, and in those in whose family there has been a history of gout. Hinton drew attention to a peculiar “irritability of the meatus attended by slight serous or sticky discharge, with itching or

pricking pain, the walls being somewhat swollen and having a tendency to purple in their redness," as a form of gouty affection. This I have many times seen.

In January 1871 a gentleman consulted me for deafness in the right ear, the left being hopelessly deaf for many years. He could not hear the tuning-fork louder in either ear on closure. The watch was heard at one inch with the right ear, the nail at two-and-a-half feet. He never had discharge or pain, and never had any noises. The external meatus was narrowed and contracted from small exostoses, and the membrane was thickened and vascular. There was occasional sense of fulness and throbbing. The sound with the otoscope was abnormally moist. He had consulted Mr Hinton in 1869, and I had several communications with him about this case, in which he took a great interest. Both ears were much in the same condition,—the appearance before referred to, viz., a moisture and packing up with epithelium. Mr Hinton regarded the case as of a gouty nature. The patient was always relieved by iodide of potassium and gouty remedies, the employment of the douche, and injections of iodide of potassium into the middle ear, with careful attention to the external meatus. The last time I saw him he was considerably and permanently benefited.

In 1870 a gentleman (age 60) consulted me for deafness arising from a condition much the same as that described in the last case. The exostoses were perhaps larger. He had become gradually deaf, and was worse in one ear than the other. He never had suffered from gout himself; his grandfather and father both died from the effects of gout. Other members of his

family are greatly afflicted by the same malady. He was convinced that his condition proceeded from the same cause, and doubtless he was correct. Nothing improved him.

In 1873 a gentleman (age 40) consulted me for extreme deafness in both ears. There was a gouty history, and he was of a gouty family. He always lived well, and indulged pretty freely in alcohol. The meatus of one ear was almost completely occluded with an exostosis, and there was a similar condition, though less in degree, of the other. Under treatment directed to reducing the congested condition of the meatus by frequent cleansing with astringent injections, attention to the cavity of the tympanum, with constitutional remedies, he improved considerably before he passed from my care.

Syphilis.—In children the fact should not be forgotten that transmitted syphilis is a frequent source of ear mischief. It is difficult to say when the morbid changes which bring about this terrible form of deafness commence. Struma and syphilis have both their share in producing aural complications in young children. But while frequently to the former are attributed the symptoms which are observed in the young child and infant, the presence of the latter is overlooked. In many obscure cases where there is no proof of the parents being strumous, and no appearance of a strumous diathesis in the child, the search must be cautiously but carefully made for a syphilitic origin. More particularly is this necessary in those acute cases which we occasionally meet, when a child or young infant is attacked rapidly with inflammation in the middle ear, followed by profuse otorrhœa, and perhaps convulsions and death. In such

a case that I saw lately there was general blood-poisoning and collections of pus formed in different parts of the body; the attack was ushered in with snuffles and an abscess over the antrum. The father had contracted syphilis, and the previous children had all died shortly after birth. Suspicions must be awakened by such a history, and it should not be overlooked, both for the sake of the patient and the surgeon. But those cases are most frequently met with in which the deafness is hereditary, and the child has never heard well, without any history of discharge, and when there has been no complaint of pain. These children, particularly amongst the poorer classes, are not brought in the earlier years of childhood, and we are not often consulted until the growing deafness has become so inconvenient, at or about the age of puberty, that the parents are forced to get advice. The symmetrical nature of these cases, as pointed out by Mr Hutchinson, may assist in the diagnosis. The presence of the characteristic teeth, also described by him, the coincidence of syphilitic lesions of the cornea, the proofs of old skin affections, and the general characteristic appearance with which we become familiarised on seeing a number of such cases, will confirm the diagnosis. It is for the deafness with the post-nasal catarrh and ozænatous discharge that accompanies it that such cases are brought. The dull cornea, the nasal speech, the deformed teeth sufficiently distinguish them.

We have Hinton's testimony that one-twentieth of the cases of deafness attending Guy's Hospital had as their cause hereditary syphilis. This proportion has certainly not been nearly so great in the cases under my care. This, of course, would be accounted

for by the greater prevalence of inherited syphilis in such a city as London. The three following cases are typical of the hereditary syphilitic class, and therefore I refer to them here.

Mary A., orphan, age 18. Could trace no family history. Has always been deaf; barely hears the watch on contact with left ear; altogether deaf with right. There has never been any pain or discharge. Cornea of both eyes is dull. There is a peculiar nasal voice, and difficulty in pronouncing some words. The external meatus of both ears is healthy; the membrana tympani of both is very concave and dull, with a prominent malleus. Eustachian tubes are free. She hears a tuning-fork well in both ears when placed on the head, the sound becoming duller on closure of the ear; tonsils congested, teeth normal.

A. M. H., female, age 15. Her father, who is dead, was affected with deafness. She has been deaf since childhood, and the deafness has greatly increased of late. The cornea of both eyes is dull, and old interstitial deposits exist. The hearing is apparently almost completely destroyed, neither hearing loud noises nor conversation in the loudest tones. External meatus healthy; membranes extremely concave and dull, with marked pockets; Eustachian tubes closed. Has the same peculiar lisp and difficulty of pronunciation as in last case. Teeth partially syphilitic and discoloured.

Miss —, age 15, consulted me, November 1874, for old interstitial keratitis. She was the first child not still-born of the family; all the previous children were syphilitic. She has also now slight deafness and typical syphilitic teeth. Her eyes were healthy until she was

five years old, when she had an attack of interstitial inflammation of the cornea, and a second attack five years subsequently. She has the peculiar look and curious articulation which I have noticed in some of these patients.*

Pain.—Pain, more or less violent, is present in all acute inflammatory affections of the ear. For instance, it is, as a rule, very acute in ordinary furunculous abscess of the meatus, in acute perforation of the membrana tympani, and in acute inflammation of the same. Pain, under any of these conditions, may produce a state bordering on delirium, so wild and fierce may it become, especially at night. So also the constant deep throbbing pain, when mischief has extended to the internal ear, is peculiarly intense and most difficult to relieve. This latter pain, in those cases which I have seen, is characteristic as radiating over the side of the head, and is often accompanied by frontal ache and great intolerance of light. In children, especially, is the occurrence of

* Let me refer briefly to the teeth here alluded to, and which have been described by Mr Hutchinson as characteristic of hereditary syphilis, and ask attention to the distinction drawn by him between the teeth of persons affected with hereditary taint, and those who have had mercury administered in infancy, and who have, as a consequence, the teeth of mercurial stomatitis.

MERCURIAL STOMATITIS.			HEREDITARY SYPHILIS.	
Teeth primarily affected,	=	} 1st Molars.	}	Central upper incisors.
		Premolars escape.		
Character of abnormality,	=	<div style="display: flex; align-items: center;"> <div style="font-size: 3em; margin-right: 10px;">{</div> <div> Enamel deficient, transverse lines on incisors and canines, dirty, discoloured, coated with tartar; pitted. </div> </div>		
		<div style="display: flex; align-items: center;"> <div style="font-size: 3em; margin-right: 10px;">}</div> <div> Peculiar <i>notch</i> in incisors, dirty, badly formed: often combination of effects seen in deficient enamel and dentine from mercury and syphilis. </div> </div>		

See Hutchison's "Illustrations of Clinical Surgery."

pain of importance, as it is often the only guide to the malady from which the little one suffers; the carrying of the hand to the head and the affected ear drawing the attention of friends and physician, long before the occurrence of discharge, to the seat of the mischief. But in many cases it is surprising what an abnormal condition of things may exist without the occurrence of pain. Constantly we see persons with evidence of long-standing disease, as exostosis of the meatus, polypus, thickening of the membrana tympani, or even perforation of the same, and thickened states of the membrane of the cavity of the tympanum, or ankylosis of the ossicles, all lesions of a chronic character, in which no pain has been complained of, and in which patients deny its existence. Some of the most intractable forms of deafness, with nervine complications, are those in which there never has been from first to last any pain. The presence of pain is of value chiefly in showing the acute nature of the attack, and (excluding causes existing in the meatus) it will point to inflammation of the membrane, and if there be no appearance of such, to mischief in the cavity of the tympanum or in the internal ear. The advent of acute pain in an old-standing case of aural disease, where there is not any manifest cause for its occurrence, should always be looked on with suspicion, the more especially if such be accompanied by any general constitutional symptoms, such as rigors, vomiting, alterations in the pulse, constipation, or drowsiness. Pain in the ear under any circumstances should, both in old and young, receive immediate attention, and its source be carefully ascertained.

Discharge.—The history of a discharge, the length of

time it has lasted, and the states which have preceded its occurrence, the fact of its being coincident with pain or relieving it, its nature, if mixed with epithelium and mucus, its quantity, should separately be inquired into. It is well to see if there is any foul smell, and if the discharge be mixed with blood. One clear rule should be always observed—namely, to regard discharge from the ear as but a symptom of some diseased state of the auditory passages, and one which must be dealt with only after ascertaining its exact source. Nothing can be more mischievous than to regard the mere discharge as the disease, and to remain satisfied with undivided attention to it without arriving at a correct conclusion as to the cause of this symptom. Frequently I have seen polypus, perforation of the membrane, destruction of the ossicles in cases treated as “otorrhœa,” and these serious complications have been overlooked from neglect of the simple precaution of examining an ear carefully with a speculum when the discharge has been all removed. As a diagnostic symptom, discharge is valuable by directing our attention from the external meatus to the membrane and the middle ear, the constant sources of its presence.

The Hearing Power.—The method I adopt to note the degrees of hearing is as follows:—

H.D. W. not heard. If the watch be not heard when pressed against the ear.

Contact. If it is heard only when it touches the ear.

$\frac{1}{50}$. Heard at one inch.

$\frac{2}{50}$. Heard at two inches, and so on to

$\frac{50}{50}$. Normal. H.D.

In testing with the watch it is well, in the case of children, to turn the child's face away before holding the watch to his ear, otherwise, as Mr Lennox Browne has noticed in a letter on this subject referring to these remarks, the child on seeing the watch may say that it is heard, when it is not. I find a chronograph repeating watch that I use an admirable means of testing the hearing in children. The little patient is attracted by the strokes of the repeater and the chimes. Placing the child at various distances from us, we can direct him to turn quickly round as the watch strikes or chimes; this he readily does, and we can thus gain a pretty fair estimate of the hearing power. By slipping the watch from one hand to the other we may easily test the veracity of the child. Stupid and nervous children do not intentionally deceive, and it is a mistake on the part either of surgeon or friends to threaten or treat them harshly while testing their hearing.

If the watch is found to fail, the nail furnishes a good test in bad cases, the distance at which the click of the nail is heard being noted. Or the tuning-fork may be tried with the normal ear and the affected one, and the length of time the perception of the sound is retained marked. So also the patient may be tested by engaging him in conversation at different distances, and with his face turned away from the examiner. The fact of his hearing better in a railway carriage, or worse at a dinner table, when many persons are speaking, and not being able to join in a conversation, should be recorded. This latter peculiarity points particularly, in my experience, to affections of the middle ear and ankylosis of the bones. In some instances the tuning-fork will be heard only

when placed against the teeth. The instances are rare where it is not so conveyed.

Dr Turnbull has made some interesting experiments to test the power of perception of musical tones by the human ear. He used König's rods. "They were made of choice white, tempered steel. These are held suspended by a silk thread, either close to the ear, or at a definite distance, say thirty-five feet, from the patient, and then tapped on the end with a little steel hammer, which causes a clear, ringing over-tone like a bell. They are two centimetres in diameter, and from two and a half to ten centimetres in length, so that they regularly increase from 20,000 to 60,000 vibrations in the second, according to their size." They were held within two inches of the ear; their temperature was about 70° Fahr. The observations were made in a room remote from noise, and during cloudy weather. With these rods he could accurately test the perception of the finest musical tones. From the table he has published the average capacity of the normal ear for high tones between the years of twenty and thirty would appear to range from 40,000 to 60,000. It was a little lower in the advanced periods of life. In several of the cases where a marked difference was observed between the two ears, this was in favour of the left, with the single exception of the case of the gentleman who distinguished 60,000 with his right ear, and who could get no higher than 55,000 with his left.

The marked difference between the limit at twenty-two and that at fifty-seven years is believed not to be due simply to senile thickening of the membrana tympani, but also to a gradual narrowing and change of

shape in the auditory meatus, together with alterations in the middle ear, diminution of conducting power of the bones, and diminished susceptibility of the auditory nerve incident upon advancing years. Professor Hughes' audiometer measures very accurately the power of hearing in a deaf person, and affords a means of exactly testing the hearing at intervals when a patient is under treatment. It consists mainly of an appliance in which the telephone is adapted by means of the inventor's microphone key to convey the most delicate gradation of sound (up to absolute silence) to the ear. It is worked by two Leclanche's cells, and the intensity of the sound is regulated by a moving coil placed on a graduated bar between the two primary coils.

The audiometer may be had from Messrs Khroné & Sesemann, from whom a full description of the instrument can be obtained.

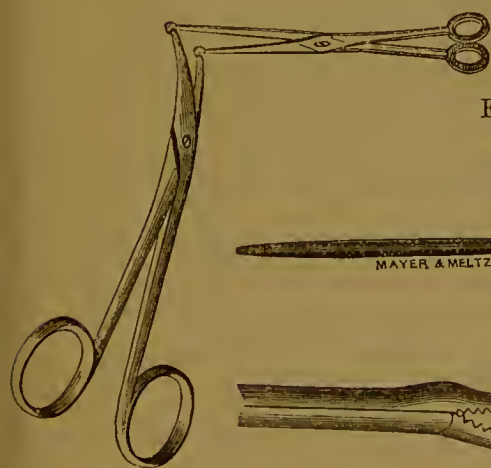
CHAPTER IV.

STEPS OF EXAMINATION—HISTORY—SYMPTOMS, ETC.— *continued.*

Auditory Meatus and Membrane.—Having thus far ascertained the characteristic symptoms from which our patient suffers, the mode of their occurrence, and the nature of their progress, with such personal or family history as may be of importance, we next proceed to examine the present condition of the auditory passages. I shall here merely detail the steps which it is necessary to take, as it will be requisite to refer to each part specially in considering the various morbid conditions requiring treatment. The external meatus (excluding for the present affections of the auricle) is first to be examined. For this purpose we must have at hand a reflector, a few different sized specula, an ear syringe, the aural probe, and some cotton wool. It is well to have the means of cleansing thoroughly out the canal and removing any small portions of epidermis or cerumen or fungus which may remain after the syringing, and which would interfere with a full view of the meatus and membrane. I use the aural probe with cotton wool rolled round the point for this purpose. It is also useful for touching the membrane with any solution in cases of ulceration or perforation, or in destroying the remains of polypi. Wilde's forceps, or

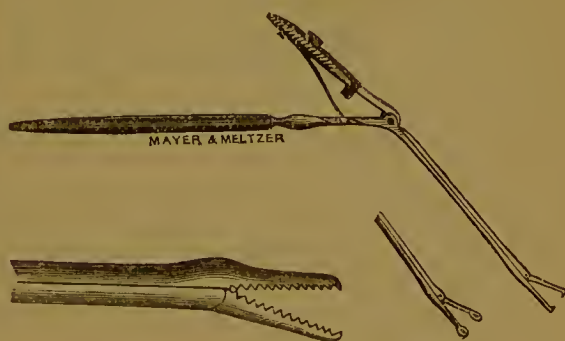
the rectangular one used by Hinton (fig. 1), or the small alligator forceps, may be required to detach adhesive epidermis, cotton wool, portions of hard wax, or foreign bodies. The rectangular forceps will be found, perhaps, the most useful; it is lighter, and the teeth being so perfectly adapted, the smallest particle may be grasped with it and withdrawn. It does not in the least interfere with the view of the meatus, and may be used through a wide speculum. We have now to place our

Fig. 1.



Rectangular Forceps.

Fig. 2.



Alligator Mouth Forceps.

patient in a good position for examination and to introduce the speculum. Whenever we can take advantage of it, there can be no doubt that, as Hinton says, "ordinary daylight gives the most distinct illumination." A beautiful view of the membrane may be obtained by means of sunlight, but the light must be thrown rather on the wall of the meatus than directly on the membrane, as by its intensity it dazzles and

prevents us seeing distinctly. It will be found most convenient to examine the patient standing, so as that he can be quickly moved in any direction. I generally get the person opposite to me and partly between me and the light.

A child is best examined sitting on the lap of the mother or standing on a chair, the head, if the child is restive, being fixed by the mother or some assistant. The mirror with the spectacle frame ordinarily used in laryngoscopy, with the ball-and-socket joint, will be found most useful, as with it we can either examine with the hand, or with the mirror on the face. With a little practice full examination can be had from the face-mirror, and if there is any manipulation necessary it is the best method of using the mirror, as we have then both hands free to operate with. If we use artificial light, and employ the bull's-eye burner, with the universal bracket, to be had of any instrument maker, the patient must be placed sitting, and with the light a little to the side of and behind him. Any one can, after a short time, familiarise himself with the steps necessary to make a complete examination by this method.

For bedside purposes, and in houses where we are called to see patients at night, the most perfect lamp I know is that of Messrs Weiss. It is contained in a small portable case, $3\frac{1}{2}$ inches by $3\frac{1}{4}$, which holds a lamp and paraffin; the lamp, which, with a miniature bull's-eye burner, furnishes a beautiful clear light, can either be placed standing on a table, or held in the hand of an assistant. With it I have frequently made ophthalmoscopic and laryngoscopic examinations. It is, therefore,

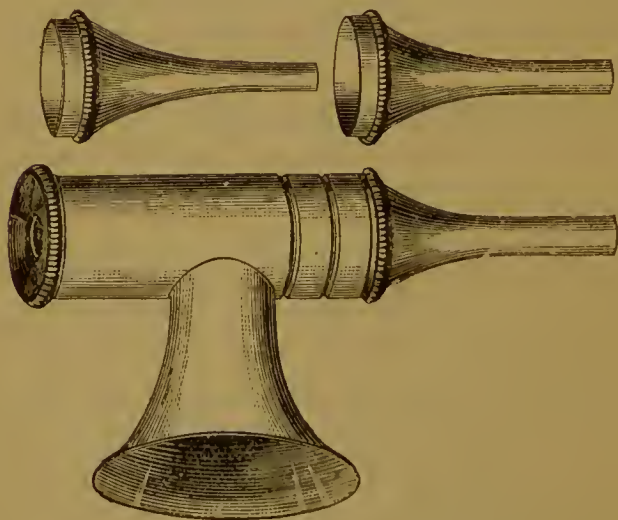
a most useful companion—in fact, almost an indispensable one—when we are summoned in a case of emergency to the country.

In introducing the speculum we must remember the great timidity that many patients exhibit on being examined. Hence it is that a light and gentle yet firm hand is required to conduct all aural manipulations. In many affections of the auricle and meatus there is superadded to the natural sensitiveness an inflammatory state which makes the handling of the ear a thing to be avoided as much as possible. Rough pulling of the auricle, or any forcible pushing of the speculum, is sure to be resisted by the patient, who may thus be alarmed at any further interference; but in any case of aural affection all force or roughness is to be deprecated. Those who cannot manipulate with gentleness had better not manipulate at all. A man's entire success with a patient will depend much on the confidence and ease with which he introduces the speculum or the Eustachian catheter; the infliction under any circumstances of unnecessary pain should be avoided. This preliminary encouragement of the patient can only be secured by keeping constantly in mind, and strictly adhering to the resolution, to *avoid all force*. It is to the careful carrying out of this principle that most men owe that delicacy of touch that comes from the constant treatment of all delicate and sensitive organs, such as the ear, eye, and urethra. No rough or awkward surgeon can ever be an aurist.

Different varieties of specula have been brought into notice since the time when Grüber and Wilde first introduced theirs to the notice of the profession.

Brunton's auriscope (fig. 2) is an instrument in common use. For practical purposes either that known as Toynbee's, or modifications of it, as Turner's, will be found quite sufficient. Some surgeons prefer a speculum with an opening at the side to facilitate examination of the meatus and for therapeutical purposes, or, as recommended by Hinton, a speculum with a small piece out of the end in order that a

Fig. 3.



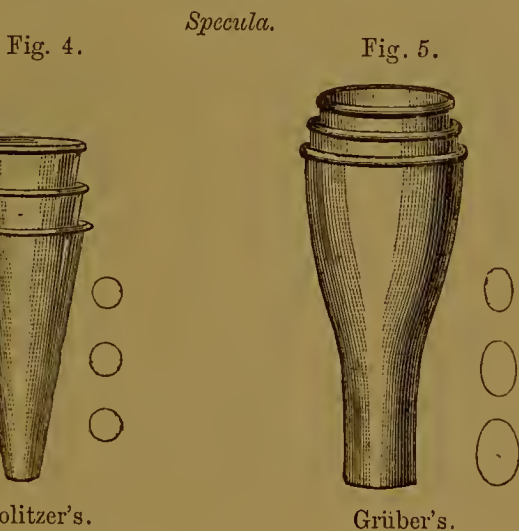
Brunton's Auriscope.

more perfect view of the membrane may be obtained. I figure (pp. 37, 38) a few of the best known kinds of specula, and will only add that the utility of a speculum does not so much depend on its form or shape as on the hand that guides it. For children it is necessary to have a speculum with a small, and, I prefer, a

perfectly circular end. For all operative steps we require as large and wide a speculum as we can conveniently pass into the meatus.

As the first essential towards successfully introducing the speculum in the adult, we must keep in mind the length and direction of the external auditory canal. The following description of Bernstein is so simple and clear that I venture to insert it here.

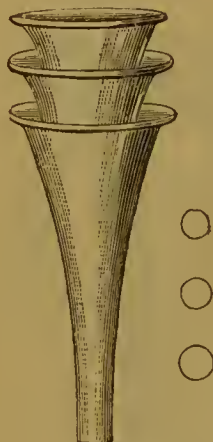
“Just as the eyelids prevent the entrance of any



injurious substances into the eye, so the external ear prevents the entrance of dust and small particles, which might easily be blown through the air into the auditory canal, and also of insects, not by a closing movement, but in the human ear by means of its peculiarly coiled form, which makes the entrance difficult to find. The latter, also, is more or less covered with minute hairs, which serve to catch any dust which penetrates without perceptibly deadening the sound.”

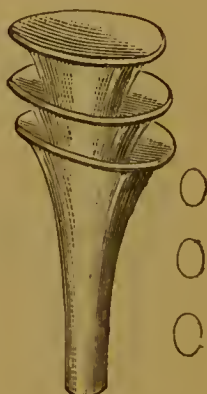
"The auditory canal, the first part of which ($\frac{1}{3}$) is composed of cartilage, and the inner part ($\frac{2}{3}$) of bone, is not a straight tube of equal width. It is contracted at the opening, which contraction turns upwards and inwards; then it expands and terminates at the tympanic membrane, the surface of which is placed at an oblique angle to it, and is directed inwards and downwards. On the sides a fatty substance, the wax of the ear, is secreted by small glands, which is

Fig. 6.



Toynbee's.

Fig. 7.



Turner's.

intended to keep the sides, and perhaps the tympanic membrane itself, in a supple condition, and to protect it from dryness."

"In introducing the speculum," says Hinton, "it must be remembered that (beginning from without) the meatus winds, first, a little forwards and then backwards, and slightly upwards, so that there is a tendency for the eye to fall on the wall of the meatus, instead of reaching the membrane; and the speculum accordingly must be

introduced well into the passage, and directed first a little forwards, for the most part with a slight pressure on the outer part of the posterior wall, to straighten the cartilaginous portion of the canal. This will be much aided by drawing the auricle slightly upwards and backwards with the left hand." We can reverse hands according to the ear examined and the position of the patient.

Tröltsch drew attention to the slow development of the osseous meatus in the child, stating that, "often until the sixth year a gap is left in the ossification, which only diminishes very gradually, and, from its sharp, irregular edges, might very easily be considered morbid and the result of caries, and at any rate might facilitate the spread of inflammatory processes to the maxillary articulation and the parotid gland;" also that "in very young children the inner half of the exceedingly narrow meatus has scarcely any open calibre, since the membrane, which lies horizontally, is in contact in its whole extent with the membranous floor of the meatus, this contact being due in part to the fact that the epidermis covering the membrane has at this time very considerable thickness."

I shall again have to refer to the important bearing that the state of the external passage has on the removal of foreign bodies from the meatus.

Having introduced the speculum well into the meatus, we note its shape and size, if narrowed and painful; if the dermis is congested or inflamed; if there is any discharge, and if so, its colour, nature, or smell; if there is a collection of cerumen which interferes with our view of the membrana tympani. If there is any pus or

epithelium blocking up the meatus it must be carefully removed with the syringe, and the passage cleaned with a little cotton wool rolled on the aural probe. The canal can then be examined thoroughly for foreign bodies, polypi, molluscous or sebaceous tumours, aspergillus, exostoses, &c.

We next examine the membrane. Here, without departing from my previously stated determination not to introduce any detailed anatomical description, I must notice the points which it is requisite to keep in mind in making an examination. The healthy membrana tympani is nearly circular (9–10 mm., Trölsch), translucent, and concave, and is fixed to the temporal bone at its circumference, and its centre to the handle of the malleus. It varies in colour from a “pearl,” or “neutral grey,” to a yellowish white, or at times even an ivory white. It is placed obliquely, and forms, with the floor of the meatus, a very acute angle, with the roof a slightly rounded obtuse angle of about 140° . Its anterior-inferior part is further removed from the external opening of the auditory canal than the posterior-superior part.

The manubrium is seen dividing the membrane into two parts or segments, the anterior or smaller, the posterior or larger. Its lower prominent end, of a yellowish colour, drawing the membrana tympani inwards, forms the depressed spot in the centre of the drum. The lower end of the manubrium itself is of diagnostic value according to Trautman, as changes in the colour, form, and degree of mobility, will point to alteration in position of the bone, thickness and rigidity of the membrana tympani, ankylosis of the ossicles. At the point

where the manubrium terminates, we see the well-known triangular spot which gives to the membrane that beautiful and lustrous appearance when light is thrown on to it by the mirror. The pyramid has its base directed downwards, but its position and extent are variable, and it is by no means uncommon to find its usual shape altogether lost, or perhaps no cone of light in an ear in which the hearing power is perfectly normal. It thus serves as a delicate indication of the degree of mobility of the membrane, as it is variously altered when the membrane is forcibly inflated. In a normal state this spot partially disappears on inflation, and the funnel-shaped depression underneath it is bulged outwards. The short process of the malleus is also of considerable importance in a diagnostic point of view, for it separates, as described by Trölstch, the inferior from the posterior pocket of the membrane, the posterior being over, the anterior under the short process. These pockets are formed by the ligamentous folds of mucous membrane or prolongations of the ligamentum mallei anterioris. They are of clinical importance, as it is now recognised that here the secretion of mucus is retained (Hinton), and that they are the source of the bulgings of the membrane which we so frequently see when this retention occurs.

Above these folds of mucous membrane at either side of the short process is Shrapnell's membrane, the most flaccid portion of the membrana tympani, a frequent situation for collections of pus, growth of small polypi, inflammatory attacks on perforations, and behind which we often have accumulations of mucous or other secretions which bulge forward the membrane at this spot.

The membrane is united to the auditory canal by its tendinous ring, which latter structure gives origin to the fibres of the middle layer of the membrane, which pass to be inserted into the malleus with its cartilaginous groove. It is well to remember the analogy existing between the membrana tympani of the ear, and the iris of the eye, in the arrangement of the radiating and circular fibres, which have a relaxing and spherical action, preserving thus a balance of power when the drumhead is in a state of rest, and which, according to Helmholtz, explain its peculiar concavo-convex shape. The close relation of the chorda tympani nerve to the membrane, defining, with the reflections of the mucous membrane covering it, the two pockets or pouches at the inner side of the upper portion of the drumhead, should be remembered. Lastly, its highly vascular nature and the free distribution of nerves to this delicate structure, account for the rapidity of the inflammatory process in it, its ready injection with blood when irritated, and the great sensitiveness and pain that accompany all such inflammatory attacks.

The lustrous epithelium of the membrana tympani, its funnel shape, and the peculiar inclination of the membrane, account both for the position and shape of the cone of light. (*Vide* "Burnett on the Ear," pages 53 and following. A most concise and admirable, and at the same time the most complete, description of the anatomy of the ear, is to be found in this treatise.)

We may now seek to satisfy ourselves on the following points:—(a) The appearance and position of the

handle of the malleus, if drawn inwards and “shortened in perspective” (Troltsch); if it appear unusually prominent or altogether displaced and dislocated from its natural position; if it is vascular with vessels on the surface, having a red appearance. (b) The triangular spot, if present, its direction and degree of lustre; if the cone has lost its distinctive shape, or if there are two or more of these distinctive spots of light. (c) The general colour and appearance of the membrane itself; its degree of curvature, opacity, and thickening; the appearance of the manubrium, the umbo, and short process; their relative prominence, vascularity, and colour; the degree of mobility or flaccidity on inflation; the signs of any deposits, calcareous or otherwise; the presence of polypus; if there be pulsation, rupture, or perforation.

We detect the patient's power to inflate the membrane by means of the otoscope (fig. 7). This simple contrivance also enables us to arrive at a conclusion as to the state of the Eustachian tube. The otoscope of Politzer is a simple india-rubber tube, having a small vulcanite ear-piece fixed at the end. Three tubes may be had connected to

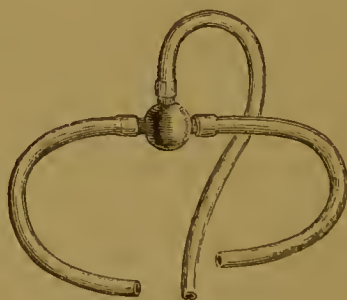
Fig. 8.



Otoscope.

a central hollow vulcanite ball (fig. 9). This form is convenient, as the patient can place a tube in each ear, and the result of the inflation of the two membranes can be contrasted. It is also useful for teaching purposes, as a student can examine the ear with it at the same time as the surgeon. By placing a tube in either ear of the surgeon, the intensity with which the sound is conveyed is increased, and the least inflation perceived. Double German otoscopes, on the principle of the double stethoscope of Scott Alison,

Fig. 9.



Otoscope.

have been contrived and used by Lucæ and Turnbull. Of these I have no experience.

The mode of using the otoscope is simple. The patient is desired to shut his mouth, and at the same time to hold his nose firmly, and then to blow (not too forcibly), when the air is at once heard with a gentle rustle impinging against the membrane. The previous insertion of the speculum when this is done will show the degree to which the patient can inflate the membrane. In the majority of cases we recognise the fact that air has

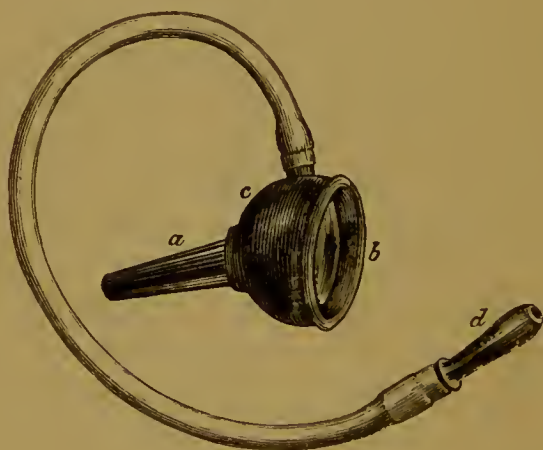
entered the tympanum by an alteration in the shape of the membrane or any temporary obliteration of the triangular spot. But there are extremes of rigidity or flaccidity, in which the drum is hardly affected, or it may be that it is blown out bladder-like, and yields abnormally to the force of the entering current. We sometimes get a peculiar moist gurgling sound of varying shades of intensity, denoting a moist state of the Eustachian tube, and probably an accumulation of mucus in the tympanic cavity. On the other hand, there is in many cases of old tympanic mischief a dry crackling sound, which accompanies that flaccidity of the membrane above mentioned, and which I have found present in long-standing cases of retained secretion. But familiarity with these various sounds is to be gained only from the constant use of the otoscope; they are to be learned not from description, but from practice. Gruber has drawn attention to the relative value of the secondary sounds which we hear during the recoil of the membrane and ossicles, &c. Though aware of the occurrence of these sounds, I have not observed any fact of practical importance in connection with them.

For further determining the presence of adhesions of the membrane and the mobility of the malleus, the pneumatic speculum first introduced by Siegle is very valuable. It consists (*vide* fig. 10) of an ordinary vulcanite speculum (*a*), which screws into a vulcanite box (*c*) covered with a glass lens (*b*), which is also screwed on. By placing a little piece of india-rubber tubing on the tubular part, it fits air-tight into the meatus. The box has an india-rubber tube and a

mouth-piece (*d*) connected with it, which is placed in the mouth of the surgeon; suction is applied to the end of the tube, and the air drawn from the meatus, thus acting on the membrane, with a good light thrown on it through the speculum; this is seen magnified, and any adhesions and inequalities which may exist are disclosed.

I before referred to the value of the pneumatic speculum in the relief of tinnitus, a fact first dwelt

Fig. 10.



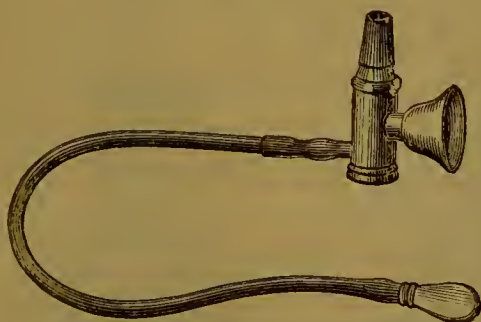
Siegle's Speculum.

on by Mr Hinton. Fig. 11 is a representation of Mr Alexander Morison's speculum, a description of which, in his own words, I quote from the "British Medical Journal" of December 22, 1876:—"This is simply a miniature Brunton's speculum with an exhausting tube having an ivory mouth-piece attached. Near the point where the elastic tubing joins the speculum, there is a small valve which closes on re-

spiration, thus preventing the breath from dimming the reflector. The advantage of this modification is, that, on account of the reflecting mirror in the speculum, and because of the observer looking directly on to the membrane through a lens placed parallel with the surface of the eye, the membrane can be more easily inspected than by direct light and through the obliquely placed eye-piece of Siegle's original speculum."

But by far the most valuable means of ascertaining the condition of the membrane and the Eus-

Fig. 11.



Morison's Speculum.—(Modification of Brunton's Auriscope.)
(*Arnold & Son.*)

tachian tube is that devised by Dr Politzer. A bag furnished with a valve at the bottom, such as the one represented, is used—a piece of india-rubber tubing can be attached to the vulcanite end. This, or the douche of Mr Lennox Browne, or the modification of Dr Allen (fig. 12), with the nose pieces, is held in the right hand; the patient is given a little water to keep in the mouth, and he is directed to swallow the fluid immediately on his being called on to do so. The surgeon then introduces the india-

rubber tubing attached to the nozzle of the bag into the floor of the nostril, and firmly closes with the forefinger and thumb of the disengaged hand both nostrils. When the patient is called on, or a signal is made to him to swallow, he does so, and immediately, *during the latter part of the act*, the air is expelled from

Fig. 12.



Fig. 13.



Politzer's Bags for Insufflation.

the bag, and it rushes into the ears, just as the fluid is passing into the oesophagus, as the larynx is raised with the thyroid bone. The moment at which this manœuvre should be carried out is best seen by watching the completion of the third act of deglutition in the infra maxillary space at the side of the neck. It is best to

make the patient hold the head to one side in swallowing the water, and use the bag through the nostril opposite to the Eustachian tube, through which it is our object to drive the current of air. There is no difficulty whatever in carrying out this simple manœuvre,

Fig. 14.



Poltzer's Insufflator, with
Allen's Improvement.

Fig. 15.



L. Browne's Air
Douche.

and even children get quite accustomed to the inflation if in the beginning they are taken gently and gradually taught. Mr Dalby recommends for children the use of an india-rubber tube "with a mouthpiece at one

end and a nozzle at the other," and he blows through the tube as they swallow. Figure 12 represents another variety of Dr Politzer's bag; it is furnished with a tube and two nose pieces. This the patient can use himself, and by it we avoid the unpleasantness caused by pushing the tube into the nostril. The douche that I give to patients to use themselves is that represented in figure 13, but I prefer the plain Politzer's bag (fig. 14) to any other form for my personal use. (These instruments may be obtained of Messrs Khroné & Seseman, Duke Street, Manchester Square.)

Professor Lucæ has drawn some important conclusions regarding the condition of the pharyngeal orifice of the Eustachian tube during the act of swallowing. Professor Lucæ does not think that during the act of swallowing the tensor palati opens the tube, but he rather inclines to the belief that "this muscle, right after the completed act of swallowing, participates in the re-opening of the tube, occurring simultaneously with the cessation of the action of the levator palati and the sinking back of the velum." He explains how "the tubal muscles bring about a physiological ventilation of the ear. This ventilation of the ear is not affected, according to this observer, by the opening of the usually closed tube at swallowing, but by the fact that the usually patulous mouth of the quite loosely closed membranous-cartilaginous tube is powerfully compressed by swallowing, and after the act is opened again."

Professor Lucæ has thus found that we may blow air into the middle ear by employing a movement which will cause the velum palati to hermetically close the

naso-pharyngeal space. "*Such a process may be effected by a prolonged phonation of the vowel a*, which will cause the velum to rise, cut off the upper from the lower pharynx, and during this act air may be blown into the nares, and thence into the middle ear, by a powerful inflation with the hand-balloon." I find, as a rule, that the ear is easily inflated during this act, and in a much simpler manner than by the old process of swallowing water.

Dr Gruber thus describes the method known by his name (*Lancet*, January 12, 1878):—

"In order to obtain an effective separation between the upper and lower parts of the pharynx, the muscles of the soft palate must be brought into play at the same moment that the Eustachian tube is opened. All this is obtained by the simple pressure of the root of the tongue upon the hinder part of the palate, if a strong expiration is made at the same moment. If one presses the posterior part of the tongue against the palate, the cavity of the mouth is shut off from the throat, and the soft palate is pressed upwards and backwards. The air, which passes in expiration into the throat, has no escape either through the mouth or through the nose, of which fact one can easily convince one's self by holding the hand, or a small flame, in front of the nose. The latter is not moved, and the hand is not conscious of the least breeze during the expiration, as would be the case did the air escape from the nose. The stronger the expiration at this moment, the more tense will be the soft palate by the pressure of the escaping air, and the more effective the closure of the upper pharynx. This moment, as regards the arrangement of the

pharyngeal parts, is the most favourable for giving the maximum degree of pressure to the pent-up air, by emptying the Politzer ball into the nose by the nozzle introduced as usual.

“Had we always quite docile patients before us, we should certainly make use of this method; as this is not the case, we must be content with such movements as come nearest to that above described. The result of the investigations which I have made in my own mouth, and in those of patients, is that we obtain the result when the consonants ‘h,’ ‘k,’ ‘k,’ are sounded together in the most sudden manner. In such a mode of operation, much depends upon the patient’s powers of comprehension, and it is often easier for the surgeon to direct the patient to repeat some complete syllable, as it will demand less explanation to make them use a vowel between the consonants, as ‘hack,’ ‘heck,’ ‘hick,’ ‘hock,’ ‘huck.’ Let any one utter the indicated syllables in succession as they are written down, and he will find that the tongue is pushed further backwards, and more firmly upwards, the further we proceed in the succession of syllables, so that with the syllable ‘hack’ the tongue is placed most forward, and with the syllable ‘huck’ is pushed back to the furthest degree, and against the parts above; and in this way the upper pharynx is narrowed, and effectually closed. The backward and upward pressure is stronger, and the closure more effectual when the combination of consonants ‘hck’ is uttered without the vowel.

“The treatment which I now, supported by the facts given above, recommended for cases alluded to in the preliminary remarks is as follows:—The operator stands

or sits, as is most convenient for him, in front of the patient, and the end of the nozzle of the syringe (the ball of which is held in one of the operator's hands) is passed to the depth of one-third of an inch into the nasal opening. The operator then, with the thumb and first finger of the other hand, closes the opening around the syringe nozzle most carefully, and while the patient utters one of the prescribed syllables ('hack,' 'heck,' 'hick,' 'hock,' 'huck,' 'hck'), the ball is compressed, and the air flows with a clearly perceptible noise through the tubes into the tympanic cavity.

"If I allow the patient to incline his head strongly towards one shoulder during this treatment, it is always successful, especially if I pass the nozzle into the nostril which corresponds to the ear into which I wish to inject the air. In those cases in which the air came into the ear of the other side as well, it almost always happened that the patient could feel the passage of air more strongly in the upturned ear. If the patient, treated in this way, once perceived certainly that the air entered the ear, he had the same perception if I repeated it several times one after the other, or on different days.

"To sum up the advantages of my method over that of Politzer:—

"1. It is more simple. The swallowing movement being abolished, the sipping of water is no longer necessary. One needs to learn the objection patients feel to this water drinking in order to estimate the boon it would be no longer to need it. Although I have used this method of treatment much less frequently than others, still there always stood on my

table a great number of glasses ready, and it often cost a patient a great effort of will to take a sip out of my glasses. How can you blame him, when you remember that one's consulting-room is at all times receiving patients suffering from contagious diseases?

"It is easily understood that when the treatment is needed frequently the swallowing of so much water is not only troublesome but hurtful. If it is said that the patient could make the swallowing movement without water, I would reply that then the introduction of air through the tube often fails; and, on the other hand, that the frequent empty swallowings are more painful than when water is used. I will not mention cases in which diseases of the neck render deglutition difficult further than to say that, while attempting to swallow, air passes into the stomach, and causes severe pain, until several eructations have relieved the organ of the injected air.

"2. Is one able to keep the pharyngeal parts in the position assumed in uttering the prescribed syllable, especially the 'k,' then the air can for a longer time be made to enter the tubes than could be the case with the brief act of swallowing, which cannot possibly be prolonged, and I hope it will some day be possible to direct medicaments into the tube in this manner.

"3. By using the above list of syllables carefully the air may be made to enter the tubes with varying degrees of force, which advantage will appear more clear when it is mentioned that the suddenness of the action in the Politzer method has often led to tympanic rupture.

"4. My method is especially adapted for self-

treatment, because the patient learns by his own sensations to increase the force with which the current is sent into the ears."

Another method is that recommended by Tansley, who gets the patient to blow strongly, as if blowing out a light forcibly, and when the cheeks are thus distended compresses the bag.

The olive-shaped nozzle (fig. 13) recommended by Weber-Liel is perhaps the best to use.

CHAPTER V.

STEPS OF EXAMINATION—HISTORY—SYMPTOMS, ETC.— *continued.*

WITH Politzer's bag we can diagnose any perforation of the membrane which may escape our notice with the speculum, the air as it passes through the aperture conveying a characteristic whistling sound through the otoscope to the surgeon's ear. To examine a patient for perforation we must first carefully cleanse the meatus, and get a full and distinct view of the membrane. If the perforation is large there will be no difficulty in recognising its presence, the clean cut edges marking its size and position. In many instances the membrane is almost entirely absent, and then we get a view of the cavity of the tympanum, which often has a granular appearance. Hinton says that perforation of the membrane is never absolutely complete. Since I read this statement, I have had several cases in which, after careful examination, I could trace no vestige of membrane remaining.* Frequently one meets cases where nothing but the rim of membrane close to its attachment remains. The malleus may be absent, or only a portion of the handle remain, or all the ossicula may have disappeared. I had two cases at the hospital lately which served admirably for demonstra-

* Such a case is depicted in the *Atlas*.

tion to students of such extensive destruction. In both, the inner wall of the tympanum was completely exposed; in one, the fenestra ovalis and promontory were visible, and all the ossicles destroyed; in the other the stapes alone remained, and was seen applied firmly against the fenestra. But often with the speculum it is not easy to diagnose a pin-hole perforation or a slight rent or slit in the membrane. The presence of a minute dot of cerumen, a tiny blood clot on the membrane, a fine foreign body, an old scar or the cicatrix of a healed perforation, may each be taken for a small perforation. We must then on all occasions when in doubt about perforation, confirm the diagnosis by insufflating the ear; one end of the otoscope being placed in the surgeon's ear, and the other in the affected ear of the patient, the ear is, as I have previously described, inflated by the bag of Politzer, and if there be any aperture or chink the air whistles through it with the unmistakable sound of perforation. It is then of importance in any ambiguous case not to arrive at a conclusion until the patient has been insufflated. In the great majority of cases, on fixing our eye well on the spot where we suspect an aperture, and throwing a good light on it through the speculum, we can see the small bubbles of air issuing from the perforation or fluid oozing through it from the tympanum by Valsalva's inflation. Sometimes the hole is covered by a bright bubble of air, the glisten of which at once shows the seat of the perforation. All deceptive appearances are discovered by the adoption of these two methods: first, by careful examination with the speculum and watching the suspicious spot on inflation; secondly, by the use of

the otoscope and Politzer's bag. Not alone may we see the perforation, but we can recognise any adhesions that may have formed, binding the membrane to the inner wall of the cavity or to the stapes and promontory. The membrane may be thick and cartilaginous-looking, a condition frequently accompanying ankylosis of the bones. In arriving at a conclusion from the history, and especially from the nature of the deafness, as to the seat of the malady, when the cavity of the tympanum is affected, we generally have some general characteristic symptoms which guide us to a conclusion before we test the case with the tuning-fork. This may not be necessarily an attendant on the lesions of the tympanum referred to. But there is a certain set of symptoms, some of which are almost invariably met with in every case where we have ankylosis, adhesions, or rigidity of the membrane lining the cavity of the tympanum. A lucid description of the typical symptoms which are complained of by the great majority of patients who have adhesions of the membrane tympani and ankylosis of the tympanic bones is given by Mr Toynbee. There are no more important passages in his work on "Diseases of the Ear," than those in which he so clearly depicts those symptoms so well known to all aural surgeons, and which when described by a patient almost infallibly point to the seat and nature of the affection.

"Many patients will most distinctly hear a single voice, although low, but are puzzled to hear anything distinctly when two or more persons are speaking; others hear the voice, but cannot discriminate the words; others again can hear slow conversation, but

cannot follow it when rapid. These symptoms show that the *adapting power* of the ear, dependent as already shown upon the ossicles and their muscles, is at fault. But the history of the case, showing it to be one of slow hardening of the tympanic mucuous membrane, together with the absence of all those symptoms which render it liable to be confounded with other diseases, as nervous deafness, obstruction of the Eustachian tube, &c., are usually sufficient to enable an attentive observer to form a correct diagnosis.

“Thus the patient will hear perfectly a single distinct voice, but a second voice intermingling completely disables him from hearing either ; he having lost the power of rapidly adjusting his ear to suit the sound of the voice of the person immediately addressing him to the exclusion of that of the other. Yet another striking symptom of the early stages of the affection is the necessity of exercising an act of distinct volition in order to catch the sound of a voice, which ceases to be perceptible as soon as the effect is relaxed. It has, indeed, happened to me to receive patients whose complaints consisted not in being dull of hearing, since they could hear everything said in a room, but in not being able to do this without a prolonged effort of attention, the fatigue of which soon became intolerable. This latter condition is, of course, perfectly explicable from the more or less rigidity of the chain of bones in this disease, and the muscular effort consequently required to move it and keep it in constant motion.

“Another symptom, and one certainly characteristic of the latter stages of this affection, but which it is not in my power to deny, may not also be present in an-

other disease of the ear, is the immense improvement of the hearing which attends the patient's travelling in a carriage over a hard road, by which considerable vibration is communicated to his body; a vibration that doubtless in a degree shakes the chain of bones, and imparts to them a kind of vibratory movement, which permits the muscles, while it lasts, so to act on those bones as to restore more or less of their proper functions in adjusting the pressure on the labyrinth."

Tuning-Fork.—We now come to the most important step in the process of examination. The diagnosis of an obscure aural case is incomplete without the test of the tuning-fork. It is well to have at hand a few tuning-forks of various sizes and different keys. It is necessary here to repeat what has been elsewhere so well described by Politzer and other recent writers on this subject. "To Lucæ," says Hinton, "we owe the first scientific appreciation of this test." That knowledge is founded on the fact that if the external meatus is closed the sound of the tuning-fork placed on the head or against the teeth in the median line of the lower jaw, is increased.

It is not in keeping with the design of this work to enter into the various physiological and acoustic reasons which have been assigned for this. It is sufficient to recognise the fact that vibrations passing through the solid media, the bones of the head, are intensified and the reflections increased when the external meatus is closed, in the normal state, and that those vibrations are prevented from escaping. Whether this obstruction is in the meatus or in the cavity of the tympanum, the effect is identical. Cerumen, a foreign body, polypus, obstruc-

tion from epithelium and hardened mucus in the external passage, or accumulated mucus in the cavity of the tympanum, will produce a similar effect. It is, right, however, to say that in my experience this is not an absolute rule. There are persons whose hearing is very acute, and in whom there are no symptoms of any abnormal conditions, who do not hear the tuning-fork louder on closure. Some time since, in trying the tuning-fork on the heads of some bystanders and explaining the reasons for the use of the instrument in diagnosis, the accuracy of the theory received rather a blow, when, the first person (a student) on whose head it was placed for experiment, and one who had remarkably good hearing and had never had anything wrong with his ears, declared that he did not hear the tuning-fork louder on closure of the meatus, but, of the two, less so. I tried him several times with the same result. There was no cerumen, the membranes were healthy; all the bystanders were, however, influenced differently. This is not the only time that this unusual result has been stated to me.

Nothing in the examination of the ear requires the exercise of so much patience as the trial with the tuning-fork. Each experiment should be repeated a few times, and the patient kept in ignorance of the result expected. Deaf patients, especially the poorer ones, are often intensely stupid. To arrive at a truthful conclusion, we must try their accuracy several times. It is a good plan to return to a previous step in the examination, and to repeat the question as to the intensity of the sound. Constantly, patients will at the same examination contradict assertions which a minute before they

have made with the greatest confidence. I find it often at the hospital a trial not alone of the tuning-fork, but still more of my patience, to elicit the truth which they quite unintentionally obscure. I generally adopt the following method of testing, whether the deafness be unilateral or bilateral:—

1. Ascertain if the sound is heard louder in either ear, the meatus of each remaining open.

2. If the sound is heard louder in either ear, or the contrary, the meatus of each having been closed alternately with the finger.

3. If the sound, as heard with the meatus of each ear closed, is louder as contrasted with its intensity when both ears are open. This I do by making the patient, with his thumbs in readiness, quickly close the ears on placing the tuning-fork on his head, and by testing him alternately with both the ears open and closed.

Let us take a few uncomplicated examples. We have by the speculum excluded any cause which can exist in the external meatus, such as cerumen, polypus, epidermis, or foreign body. We wish to arrive at a conclusion as to whether the deafness and tinnitus are due to tympanic obstruction or to disease of the nerve.

First, a patient hears *badly in the right ear*, and well in the left. With the tuning-fork on the head in the first step of the examination, he hears it *loudest in the right ear*. The *presumption* is—*mucus in the cavity of the tympanum of that ear*. On closing the left ear the sound is intensified in it, equally, if not exceeding, that heard in the right one. On closing the right one the sound is not increased, as a rule. The diagnosis is com-

plete in the vast majority of cases; it is one of obstruction in the cavity of the tympanum.

Secondly, a patient is *deaf in both ears*, with or without tinnitus. The tuning-fork placed on the head is *heard loudly and equally in both*, and there is *no difference, or very slight, on closure of either meatus*. We diagnose *mucus in the tympanum of each ear*.

Thirdly, a patient is *deaf in the right ear*, with or without tinnitus. The tuning-fork placed on his head is *heard louder in the left ear*. We assume *nervine deafness of the right ear*. On closing the left ear, the sound is *intensified in it*; on closing the right, there is *no difference*. In my experience in the majority of cases it is, of the two, *less*. We confirm the diagnosis of *nervine deafness in the right ear*.

Fourthly, a patient comes to us *deaf in both ears*, with or without tinnitus. The tuning-fork placed on the head, *he hears perhaps badly, and the sound dies rapidly away*. This can be ascertained by testing him as usual, and transferring the fork quickly to the observer's head or teeth, on the patient's making a signal that the sound has disappeared. It is possible *he may not hear the tuning-fork at all* when placed on the head, and we must transfer it to the teeth before the vibrations are conveyed. Closure of either ear produces little difference (*Hinton thinks slightly increases the sound*); of the two, I am inclined more frequently to think, lessens it. We diagnose *nervine deafness of both ears*.

Such is, up to the present, the result of my experience in the majority of cases. On the disputed point of the patient hearing the sound less distinctly on closing the deaf ear (Roosa) in a case of uncomplicated *nervine*

deafness, or its being slightly intensified (Hinton), after examining many hundreds of cases, I believe that the result is variable. This may arise from some error in diagnosis. Complications may exist which escape observation, and may be outside our power of diagnosis. Such complications existing in the tympanum, and which involve its membrane and ossicles, would influence the result. That they co-exist frequently with nervine deafness is, of course, true, and hence it may be the case, that much of the difficulty lies in this source of error.

Though the above rules as regards the diagnostic value of the tuning-fork are generally found to lead to a correct conclusion, still anomalous cases are constantly occurring in a large aural practice which I do not pretend to account for, and which are more or less at variance with them. For instance, within the past few days these three cases have come under my notice.

CASE 1.—J. N., age 51. Right ear deaf for two years; the deafness came on after cold; he has a “humming” tinnitus; there has been an old syphilitic history, and at present he suffers from his throat from the same cause. He has never had any pain or discharge. With the right ear the watch is heard barely on contact, with the left at half an inch. He inflates both membranes—the right faintly, the left with a moist crackle. The membrana tympani of the right ear is divided into two very hollow pockets; it is unusually white, and the malleus is displaced, the handle being prominent. In the left ear the malleus is not visible, the membrane is considerably drawn in, and extremely concave and dull. The tuning-fork he hears best in the right ear. Closure of

either meatus makes little difference, the sound remaining most distinct in the right ear, though not so loud as when that ear is open; on closing the meatus of each ear the sound is less than when both ears are open.

CASE 2.—J. H., age 49. The left ear has been very deaf for two years, with constant "singing." He found the right getting similarly affected about one year since, when he consulted me, and was then relieved of the tinnitus in both ears and the hearing of the right ear was considerably improved. His hearing distance now is $\frac{6}{50}$ with the right, and the watch is not heard in contact with the left. The tinnitus has returned, and it is for relief from this symptom that he has come again. The membranes show but little change from the normal state; he inflates both ears with a dry sound; the tuning-fork is heard loudest in the right (the good) ear; on closing the right the sound is increased; closure of the left, he fancies, rather intensifies the sound in the right; when both ears are closed the sound is slightly lessened.

CASE 3.—P. K., age 16. When seven years old he had scarlatina, and after the attack the right ear remained deaf; he has never had any pain or tinnitus, and does not recollect any discharge; the hearing distance of the left ear is normal, of the right $\frac{1}{50}$; the external meatus of the right ear is healthy; the membrane is congested, the triangular spot is obliterated, and there is what appears to be the small scar of an old perforation; otherwise its shape is normal. He inflates both membranes well; the tuning-fork is heard *alike in both ears*. With the right ear closed the sound is loudest, with the left ear closed, it still remains loudest in the right; when both

ears are closed it is louder than when both are open.

These three cases I cite as they occurred while writing these lines, and I tested each frequently and cautiously to correct any error. They are all very intelligent persons. In these cases I am inclined to believe the mischief was confined to the cavity of the tympanum and the ossicles, probably the effects of long-retained secretion, low inflammatory states of the lining membranes, adhesion, and partial ankylosis of the bones. There was little yielding of the membrane on inflation, no improvement on suction with the pneumatic speculum, and in all three cases its concave and thickened appearance verified the diagnosis. To prove, however, the utility of the tuning-fork, I cite fully this case.

Mrs ———, widow lady, age 52, consulted me in March 1876, for deafness and tinnitus in both ears. On examination I found that the cause of the affection was a slight accumulation of cerumen, the removal of which and subsequent inflation completely cured her. In December last she again consulted me. She then suffered from an "unpleasant, stupid, sensation in the head, giddiness, tendency to fall, and general debility," accompanied by complete deafness in the left ear, and "noises like the sea roaring." There was a history of irregularity during the menopause. Menstruation had ceased for one year and two months previously; she had been slightly unwell during the past month. She had several pregnancies, the last occurring in 1866. She had a general anæmic look and feeble circulation; the heart sounds were normal but weak; there was no albumen in the urine; the secretions were fairly

regular. On examining the deaf ear, I found the watch barely heard on contact, the external meatus healthy, the membrana tympani healthy and normal in shape and appearance, the Eustachian tube free. She could inflate the membrane, but not well, and the normal rustle was represented by a moist gurgle. I assumed a recent accumulation of mucus in the cavity of the tympanum, and a collapsed Eustachian tube. The mucous membrane of the throat was pale and anæmic-looking. On placing the tuning-fork on her head she said "she heard it nearly altogether in the right (the deaf) ear." I passed the Eustachian catheter and syringed out the ear with a warm solution of chloride of ammonium (gr. iv. ad. 3 i.). I then used Politzer's bag a few times through the opposite nostril. On testing her immediately after inflation her hearing distance was $\frac{3}{50}$. This treatment, added to general attention to the debilitated constitutional state by tonics, &c., was continued, and gradually the noises completely disappeared. On the third of the month she visited me, the hearing perfectly restored and the tinnitus gone.

CHAPTER VI.

STEPS OF EXAMINATION—HISTORY—SYMPTOMS, ETC.— *continued.*

THE practice of Valsalva's method of inflation establishes for us the power of the patient to force air up through the Eustachian tube and into the cavities of the tympanum. Politzer's method will frequently succeed when this plan fails. We must, however, have in many cases to resort to the catheter, and perchance assist it with a bougie.

Eustachian Catheter.—To understand the use of the Eustachian catheter, I would recommend all those who wish to study its mode of introduction to make on the dead body the usual sections of the skull required to expose the pharynx and nasal fossa. This is easily done by sawing through the base of the skull behind the styloid processes and the attachment of the pharynx, the other section being made vertically through the nose at either side of the septum. In this way, if the section be carefully made and the soft parts uninjured, the inner and outer wall of the nasal fossa are preserved. The various muscles which act on the orifice of the tube, the posterior nares, the depression behind the tube, and the tube itself can be examined.

The chief facts of practical importance that we have to recollect when we undertake the passage of the

catheter are as follows:—The Eustachian tube is about one inch and a half in length ("35 mm.; 24 mm. of which belong to the cartilaginous, 11 mm. to the osseous canal," Tröltsch translated by Hinton), the osseous portion in the temporal bone being three-quarters of an inch, and the cartilaginous portion one inch. The tube is funnel-shaped, its narrowest part being at the junction of the osseous with the cartilaginous portion. This tube passes from the anterior wall of the tympanum downwards, forwards, and inwards, to terminate at the pharyngeal orifice, which projects as the opening of the trumpet, close behind the internal pterygoid plate, on a level with the inferior turbinated bone, at the back part of the inferior meatus of the nose. Two lips bound this orifice, one posterior, directed downwards, the other anterior, turned upwards. It measures (Tröltsch) "9 mm. in height, 5 mm. in width." This faucial orifice (Toynbee) is nearly half an inch long. The pharyngeal end is the widest portion of the canal, and is composed both of cartilage and fibrous membrane. The mucous surfaces of the membrane which line this canal are in a state of apposition, the two patent points being the faucial orifice and the commencement of the osseous portion (Tröltsch). This arrangement converts the Eustachian tube into a form of valve, which in a state of rest is closed, and which opens and closes at each act of deglutition, in consequence of the action of the tensor and levator palati muscles, with the salpingo-pharyngeous, the former dilating the opening (Rüdinger and Tröltsch), the latter muscle drawing the inferior curved edge of the orifice of the tube into a straight line upwards. The palato-pharyngeal muscle assists in fixing

the cartilaginous portion. This action we are frequently performing in the swallowing of our saliva. It is this action of the palatal muscles that we take advantage of in inflating the membrane by Politzer's method during the act of swallowing the water; the walls of the Eustachian tube are forced apart and the floor carried upwards. We may epitomise the uses of the valvular canal thus:—

1. It permits of an exchange of air to the cavity of the tympanum; thus it forms an outlet for abnormal secretions and prevents their accumulation in the tympanum.
2. It prevents the rarefaction of the air in the tympanum by the successive acts of swallowing when air can enter the cavity at each act.
3. It maintains a condition of equilibrium between the air in the tympanum and the atmosphere.
4. It may influence the vibration of the membrane and the resulting sonorous effects on the tympanic cavity (Bernstein): clinical analysis would appear to verify the suggestion.

The valvular action of the tube has the most important bearing on our knowledge of Eustachian deafness. Closure or occlusion of the tube leads to rarefaction of the air in the tympanum, which, while it may filter out, is not restored or renewed. Then follows an accumulation of mucus in the tympanum, and an increased concavity of the membrane, and finally inspissation of the secretion, contraction of the membrana tympani, and thickening and adhesion of the membrane lining the cavity with accompanying changes in the ossicles.

Dr Löwenberg, in a paper reported in the "International Otological Society's Proceedings, 1876," com-

bats the usual view of the gradual absorption of air in the tympanum, supposed to take place as a consequence of closed Eustachian tube. From a study of the physico-physiological functions of the lungs, and the changes undergone by the gases of the atmosphere, and those of the blood contained in the vessels of the air-cells, he was led to attribute a somewhat similar gaseous interchange between the air contained in and entering the tympanum and the blood circulating in its vessels. He "puts the change taking place in an artificially-shut bronchus in a parallel with the one happening in the tympanic cavities with intercepted Eustachian tube." The absorbed oxygen is replaced by carbonic acid, and this leads to "a defect in the remaining total sum of gas," and this diminution accounts for the sinking inward of the membrane, which is followed by the well-known consequences of Eustachian obstruction. With a view to substitute a gaseous compound which will not suffer diminution in the tympanum, being as near as possible in its nature to the mixture which results from a previous interchange, and which must necessarily behave quite differently towards the blood in the tympanum from the unaltered air, he inflates periodically previously respired air, composed of nitrogen, a large quantity of carbonic acid, and very little oxygen, warmed to the body temperature and saturated with watery vapour. A very deep inspiration, the breath being kept as long as possible, and then a strong expiration, gives the requisite compound. But to obtain a certainty of interchange, he "submits the same quantity of air to several alternate inspirations and expirations." The patient "is made to breathe into a bag made of thin

rubber, or a bladder, provided with a cock, to which he adapts a piece of rubber tubing; the free end of the latter is introduced into the mouth of the patient, who shuts his nose with the fingers, and inspires and expires alternately from and into the bag." This air so obtained is inflated, either by Politzer's method, or through the catheter, or by aspirating the bag, with an ordinary Politzer's bag, by compressing this latter directly from the bag, and introducing its nozzle into the tubing, opening the cock, and filling the bag with the respired air, which can thus be inflated several times in succession. Acting on the knowledge that hydrogen gas is not absorbed in the lung (Regnault and Reiset), Dr Löwenberg substituted hydrogen gas for recently prepared air in inflation. He remarks on the benefit derived from these mixtures. I have been trying respired air for some time by means of an ordinary Politzer's bag with a stop-cock and piece of tubing, and my experience of its use induces me to continue to employ it in cases in which the effect is transitory with the ordinary air inflation. The mode of passing the Eustachian catheter we shall now proceed to consider.

I use a smaller catheter than that generally sold, for children, and a very fine one, in cases of obstruction. It will be found useful to have catheters of various sizes and curves ready at hand. Both the vulcanite and the silver instruments can be curved to suit each case (I prefer the latter), the former being first placed in a little hot water to soften them. It is a matter for surprise that so many surgeons still fear to practise catheterisation of the Eustachian tube. It is true that it requires some little experience to introduce the

instrument with ease and celerity; but with ordinary care and tact no harm can be inflicted in its passage, and there is nothing in the operation which a little practice will not enable every one who possesses any manipulative skill to overcome. The errors which I have seen generally committed by beginners are these :

—The catheter is taken hold of in too clumsy a manner, and held too firmly during its introduction; it is introduced too slowly; carried into the middle meatus instead of the inferior; it is not passed far enough back, and it is turned towards the ear, anterior to the orifice of the tube; or, on the other hand, it is passed back to the pharynx, and not drawn sufficiently forwards, thereby being turned into the fossa of Rosenmüller behind the faucial orifice of the tube. The essentials to success are—a thorough knowledge of the situation of the opening; a light hold of the instrument, which we introduce with the forefinger and thumb of *either* hand; that the beak of the catheter should be directed well downwards, and then glided along the floor of the nares, keeping it away from the turbinated bone; lastly, tact in avoiding the fossa posterior to the pharyngeal orifice of the tube.

It is of importance to be able to pass the catheter with either hand with facility. Frequently a patient, just as he finds the sensitive anterior part of the nose touched by the catheter, raises his hand to catch the operator's. It is well to have the left hand in readiness, so that while we restrain the patient with the right, we continue quickly the passage of the catheter with the left hand, which we transfer to it. It is necessary, also, to avoid all useless fuss in cases

where we desire to employ the instrument. The catheter should be in the Eustachian tube almost as soon as the patient becomes aware of your intention to introduce it. I now give the description of the best method of introducing the Eustachian catheter. The plan is that which is generally adopted, and is a combination of the methods recommended by Krämer, Tröltsch, Politzer, Löwenberg, and Hinton.

The catheter, held lightly between the forefinger and thumb of the right hand, the left being in readiness to transfer to it, has its curved point, directed downwards, introduced into the nostril; the hand being then raised, the catheter is carried quickly, unless there be any obstruction, *horizontally* along the floor of the nares, all force being avoided, until the pharynx is touched posteriorly. The instrument is then drawn gently forwards, about half an inch, at the same time that it is rotated upwards and outwards, until we know by the direction of the ring on the outer end that it is turned towards the ear. It is then felt in the tube having ridden over the posterior lip, and we verify the success of the operation by inflation. Löwenberg and Politzer recommend a plan which it is well sometimes to adopt, if we miss the orifice, namely, to turn the catheter in, withdrawing it from the pharynx inwards, with its point in a direction downwards, until we feel it against the septum, and then by rotating the catheter outwards and upwards, to turn it towards the Eustachian tube. Unavoidable difficulties are sometimes met with in the nares, such as abnormalities in the turbinated bone and the septum, or hardened masses of mucus. The ingenious device of Dr Noyes, who, some years since, introduced

the catheter with the double curve for right and left tube (fig. 16), enables us as a rule to disregard these obstacles, as it is seldom that both nostrils are affected in this way, and by this modification we can readily catheterise through the opposite one. The catheter is

Fig. 16.



Noyes' Eustachian Catheter.

held in the right hand for the right nostril, and *vice versa*, at a right angle to the nose, on a line with the floor of the meatus, the back of the hand being turned upwards, the beak of the catheter is introduced at the inner side of the corresponding nostril. The catheter, kept close by the septum, is carried for a short distance

backwards, when the hand is brought down, the direction of the catheter being gradually changed to that of the horizontal one maintained in passing the ordinary catheter. With a sweep it is carried round the septum posteriorly, and then rotated inwards, the point readily entering the Eustachian tube of the opposite ear.

I have been using these instruments of Dr Noyes for a considerable time, and I am constantly enabled with them to catheterise cases which would prove very troublesome, if not impossible, to manage without their assistance. The catheter being in the tube, the otoscope, one end of which has been previously fixed in the affected ear of the patient, has now the other end placed in the ear of the surgeon, and by means of the insufflator, Politzer's bag, or a tube fixed on to the catheter, the tympanum is inflated. Air is heard as if it were blown directly through the otoscope to the surgeon's ear. The annexed figure (fig. 17) shows the insufflator and catheter. I have for some time past been in the habit of employing the instrument depicted in fig. 18, kindly sent to me by Dr Turnbull of Philadelphia. It is a forceps which I find extremely useful for wiping the faucial orifice of the tube, and clearing away any collections of mucus, &c., which may obstruct the orifice. I now make it a practice in those cases where I find a difficulty in passing the catheter, to mop out well with the forceps the part about the opening of the Eustachian tube with a small portion of cotton wool, wet with some glycerine, previous to introducing the instrument.

In some persons, where the nostril is sensitive, tender,

or obstructed, I find it useful to pass a soft bulbous bougie, well oiled, once or twice before introducing the

Fig. 18.

Fig. 17.



Insufflator and Catheter.



Turnbull's Eustachian Forceps.

catheter. A patient on whom the catheter has been a few times passed can tell immediately when the tube is entered and the membrane inflated. Such persons,

who are accustomed to the instrument, are the best for beginners to examine, as they are less sensitive, bear the operation well, and can at once tell when it is successfully performed. Double catheters are made on the same principle as those used for washing out the bladder. It is asserted that with them these instruments for the cavity of the tympanum can be washed out with whatever solution we please to employ, a continuous stream being thus secured to carry off any secretion we wish to displace.

We shall consider, further, the various methods of dilating the Eustachian tube, and the application of medicated solutions or vapours to it, or the tympanum, when discussing the treatment of their diseased conditions. For purposes of diagnosis I generally use a tube with mouthpiece attached to the Eustachian catheter for inflation, and blow through this. From long experience of this method I may say that I am quite satisfied with the knowledge that it in nearly every case conveys to me. I believe that if any one educates his ear to the sounds conveyed by the passage of the breath in the various abnormal states of the membrane, the Eustachian tube, and the cavity of the tympanum, which require the employment of the catheter, we can gain but slight additional information from any bag or insufflator which may be used.

Some facts that we must not forget in using Politzer's bag or the Eustachian catheter, I may perhaps as well mention here, before I leave this step in the process of examination. I always insufflate a patient sitting. I do this, as I do not think there is the same tendency to giddiness, or if there is, the patient does not suffer to

the same extent. When in that posture I have seen giddiness and faintness, produced by inflation with Politzer's method, more than once. I have never seen any harm result from the use of his bag further than this temporary giddiness. The pipe of the bag should be directed horizontally along the floor of the nares, not upwards towards the frontal sinuses—we thus avoid the risk of forcing air into these. Here I may remark that we must be careful not to overlook the temperature of the water used in syringing an ear. I have known negligent syringing, with cold water, cause sudden faintness in the patient and a great shock to friends. This can always be avoided by using a metal syringe, and accustoming the hand on the cylinder to act as a gauge of the temperature, before injecting the water into the meatus. Also, before passing water through the ear and Eustachian tube, in cases of perforation, when we wish to wash out the tympanum, it is of importance to place the patient in a sitting posture, for here also we are likely to produce a sense of reeling and giddiness. It is right to point out the imprudence of using any instruments, throat or ear, which have been used promiscuously with several patients, or at any time after any suspicious case, or where there has been discharge, without first thoroughly cleansing such by dipping them into boiling water, or some disinfectant solution. It is unfair to the patient, and lays the medical man open to the charge of being the cause of transmitting a disease.

CHAPTER VII.

STEPS OF EXAMINATION—HISTORY—SYMPTOMS, ETC.— *continued.*

Throat.—We have now arrived at the last step necessary in forming a diagnosis, namely, the examination of the throat, and if necessary the posterior nasal passages. I assume that the method of laryngoscopic examination is understood by my readers. It is outside the object of this treatise to enter into a detailed description of laryngoscopy. Such a description may be found in the excellent treatises of Morell Mackenzie, Lennox Browne, Prosser James, or that of Professor Störk of Vienna. As it must be necessary occasionally to practise rhinoscopy in the treatment of Eustachian deafness, and as the manipulation of the laryngoscope is a less difficult one than that required for rhinoscopic examination, and as the same mirror and illumination can be employed for both purposes, it follows that any practical aurist should first familiarise himself with the use of the laryngoscope. In every case we should place our patient opposite a good light, and, with a depressor getting the tongue well down, examine the state of the mucous membrane covering the soft palate, uvula, tonsils, and pharynx. Frequently we may have only a congested condition of the pharyngeal membrane, and an ordinary catarrhal state, popularly called relaxed; this

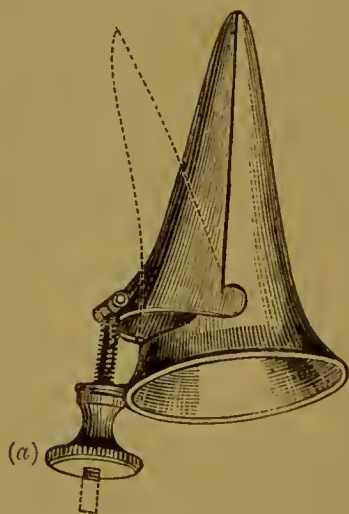
turgidity leading to temporary closure of the Eustachian tube. This is a frequent accompaniment of "cold in the head." The tonsils may be chronically congested and enlarged. This hypertrophy does not, as is well known, even when it happens to a great degree, extend so far as to encroach on the Eustachian tube. But it is one of the unfavourable attendants on Eustachian deafness, and I have no hesitation in saying, that in these cases of permanent enlargement of the tonsils, accompanied with deafness, great good is, as a rule, effected by removal of the tonsil. I make this statement from practical experience, and the notes of numbers of cases in which the improvement was marked and permanent on removal of the tonsil, and subsequent treatment applied to the faucial orifice of the Eustachian tube. We shall more fully speak of removal of the tonsil when considering the various forms of throat affection that may complicate deafness, such as adenoid growths in the naso-pharynx, with enlargement of the pharyngeal tonsil.

The tongue will, by its white patches and fissured appearance, afford us evidence of an old syphilitic history. There may be a granular condition of the pharynx, with enlargement of the follicles, and suppurative spots may cover its surface. A frequent and unpleasant, as well as troublesome, symptom is the appearance of a slimy discharge pouring down from the posterior nares, often of a dark brown or dirty green colour. This is known as post-nasal catarrh. The pharynx behind the uvula has a dry, polished appearance, and is marked with this offensive and tenacious discharge; frequently there is a disagreeable

odour from the breath, resembling that of ozæna. The presence of any of these naso-pharyngeal complications will suggest to the surgeon a close examination of the nose itself to detect any catarrhal state or congestion of the nasal mucous membrane, the presence of any discharge and its source, polypus, or ulceration. The specula figured below and on next page answer admirably for nasal examination (figs. 19–21).

The light (artificial or sunlight) can be thrown well into the nostril, through the speculum, by the concave

Fig. 19.



Duplay's Speculum.

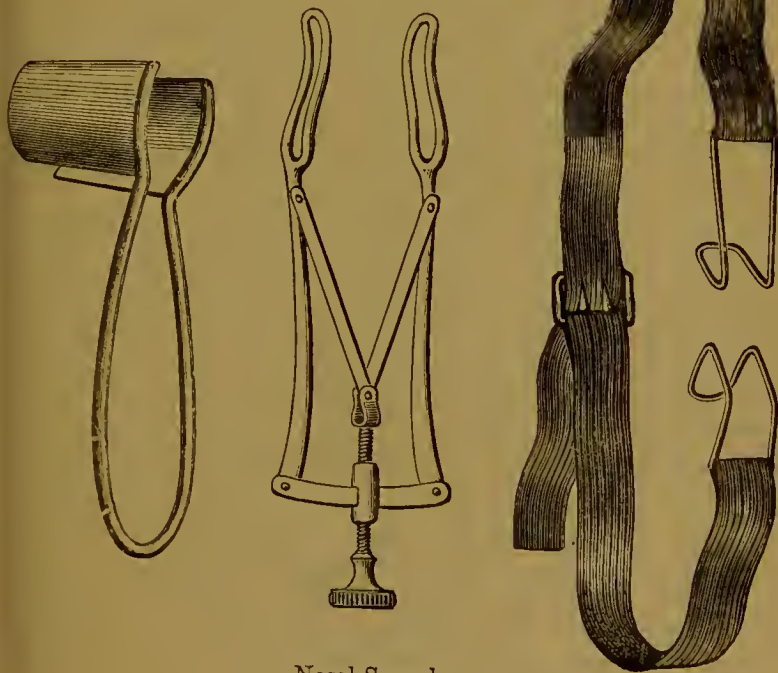
laryngoscope mirror. I prefer sunlight, when it is possible to avail of it; we can thus get a good view of the turbinate bones and meatus. By the same light and the laryngeal mirror we may examine the posterior nares, pharynx, and larynx. Fortunately, it is not often absolutely necessary to practise rhinoscopy in treating

aural affections; yet it is undoubtedly more satisfactory to see with the rhinoscopic mirror the state of the Eustachian tubes and the surrounding mucous membrane when we are treating diseased conditions of these parts, but in some cases, especially when the nostril is irritable or tender, that form made by Weiss, shown in

Fig. 20.

Fig. 21.

Fig. 22.



Nasal Specula.

fig. 21, or that of Thudichum (fig. 20), will be found preferable; both give a good view of the nares and turbinate bones. I frequently use this self-retaining speculum (fig. 22) of Mr Cresswell Baber (Messrs Wright & Co.), and find it very useful.

Posterior Rhinoscopy.—For examining the posterior nares the following instruments are required—1st, a small mirror; 2dly, a reflector; and 3dly, a tongue-spatula. The mirror should resemble the laryngeal mirror in shape, but its reflecting surface should not be more than five-eighths of an inch in diameter, and it should be fixed to its shank at a right angle. The reflector is the same as that used in laryngoscopy. The spatula is of the ordinary shape, but somewhat longer. This instrument may mostly be dispensed with.

The examination should be conducted as follows:—The lamp should have the same position as in laryngoscopy, but the practitioner in using the reflector must throw the rays lower in the fauces. The patient being directed to sit with the head erect, and to open his mouth widely, the tongue is pressed forward and downward with the spatula (or with the index-finger of the left hand), and the mirror introduced to the back of the throat, so that the plane of the reflecting surface forms with the horizon an angle of about 130° . If the uvula is drawn upward and backward, the patient must be directed to expire gently, or to produce some nasal sound. Straining and forced inspiration must be especially avoided. The practitioner will find it a good plan to introduce the small mirror between the anterior pillar and the uvula on one side first, and then to withdraw it and introduce it again in the same manner on the opposite side. In this way the posterior nares will be seen, and by slanting the mirror first to the one side and then to the other, the orifices of the Eustachian tubes will become visible. It is seldom that the whole of the posterior nares can be viewed

with the mirror, as the soft palate generally eclipses the lower third.

In the middle line is seen the septum covered with thin mucous membrane, through which the bony edge shows white and sharp. It usually slants somewhat, most frequently towards the left side. Projecting from the outer wall on each side, and extending inwards towards the septum, the middle turbinate bones are seen covered with pale mucous membrane, and somewhat resembling polypi, for which they have sometimes been mistaken. The superior turbinate bones are indistinctly seen as narrow projections of somewhat triangular shape, the apex appearing to extend downward, inward, and backward. At the bottom of the nasal fossæ are seen the inferior turbinate bones as two pale, roundish, solid-looking tumours. They do not project so far towards the septum as the middle bones. On each side of the inferior bones, though farther back and in a different plane, are the Eustachian orifices, they appear as two irregular openings looking downward and outward.

This method of examination may prove useful in cases of obstruction of the nasal passages by polypi or thickened mucous membrane, in ozæna, and in the various forms of ulceration of the hard and soft parts at the back of the nose. In cases of deafness the principal difficulty in rhinoscopy is the length and breadth of the uvula, and the shortness of the distance between the anterior pillars of the fauces and the posterior wall of the pharynx. The former obstacle may be in some measure overcome by attention to the hints given above as to breathing, or by the use of an

instrument to draw the part forward. The other obstacle is, of course, insuperable, so that in a certain number of instances rhinoscopy is quite impracticable.

Past Treatment.—Before concluding the examination of any case, it is well to ascertain the treatment which has been previously adopted. This is particularly necessary in dealing with patients affected with aural mischief. In many instances it will form a guide to the prognosis that we may be able to give. It will also prevent the repetition of the employment of useless remedies, and save the patient from interference, which cannot do good, and which may do much harm. In a large number of cases various empirical means have been already used to combat the pain or deafness, and it is advisable, both for the confidence of the patient and as a guide to the surgeon, that all information on these matters should be elicited before the treatment of a case is commenced. It is not here necessary to give any caution as to the judicious care which must be shown in asking information on such points. The reputation, the welfare, the character of a brother practitioner are in our hands; the man who, by look, word, or gesture, forgets the duty he owes that brother, through a base desire to advance his own interests at his expense, is unworthy of the position he holds as member of our profession.

Having now referred to the steps which it is necessary to take in making an examination, and the several points to which we must direct our attention, I next proceed to notice some other instruments useful in diagnosis and treatment.

CHAPTER VIII.

OTHER INSTRUMENTS EMPLOYED IN DIAGNOSIS AND TREATMENT.

It is, of course, necessary to possess a good syringe—I generally employ the one figured on next page (fig. 23), I prefer it to the many I have been in the habit of using. I rather like the screw nozzle—it does not get out of order so readily as the one that merely fits on. This latter frequently becomes loose after it has been in use for some time. The narrow metal nozzle (*b*) shown in the drawing is also very useful for removing cerumen, and will be found much more efficacious than the one with the larger bore; also the vulcanite nozzle (*c*) with the india-rubber cap can be screwed on to the syringe easily. This nozzle is indispensable for the treatment of cases of perforation of the membrane. The conical india-rubber end fits well into the meatus. The patient is directed to hold the head forwards over a vessel, and the stream is passed through the ear, and flows from the Eustachian tube through the nostril. We thus are enabled to wash out the cavity of the tympanum, remove secretions, and clear the Eustachian tube.

The rectangular forceps of Hinton, already figured, will be found in some instances a convenient instrument for removing polypi from the meatus and

membrane. But the lever ring forceps of Toynbee (figured on next page, fig. 25) is the instrument I always use for this purpose, especially if the polypus is very small, or of the "mulberry" kind, and growing from

Fig 23.



Syringe.



Fig. 24.

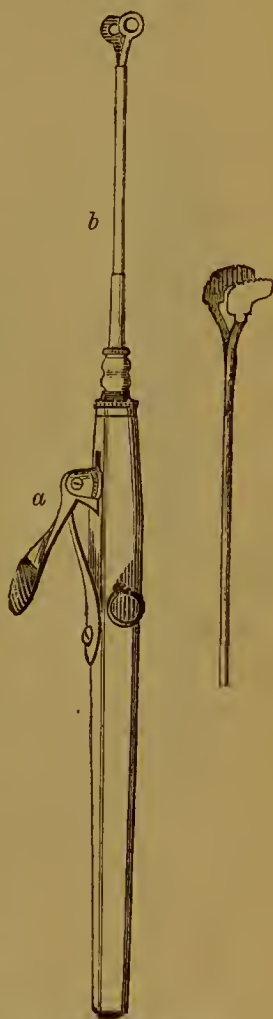
Vulcanite Nozzle with
india-rubber cap.

the cavity of the tympanum or from the membrana tympani. There is no difficulty in using this forceps. Pressure applied to the lever (*a*) pushes forward the tube (*b*), and closes the serrated rings on the polypus.

The patient is made to stand with the head inclined a little to one side; a large-sized speculum is introduced into the meatus, and the light well thrown into it with the spectacle mirror. An assistant may now support the head of the patient, and when a good view of the polypus is obtained, the forceps is carried steadily down to it with the rings slightly apart; the rings being now fairly opened, the polypus is grasped by pressure on the lever, and removed. The forceps, in the case of two or three polypi growing from the membrane or meatus, may have to be introduced some few times in order to remove the entire of the growth. If bleeding obscures the view, it is well to wash out the meatus, and then dry the surface of the membrane or the bleeding part before re-introducing the instrument.*

To illustrate the use of the lever ring forceps, I may cite this case, which has recently come under my notice. A boy with complete perforation of the membrane in both ears applied for relief at the hospi-

Fig. 25.



Toynbee's Forceps.

* I have had the most perfect ring instrument I have ever seen made for me, on the alligator principle, with lever handle, by Messrs Mayer & Meltzer.

tal. He had been previously subjected to treatment, and was under my care some years since, when he was threatened with brain mischief with severe otorrhœa. On syringing the left ear I perceived in the cavity of

Fig. 26.

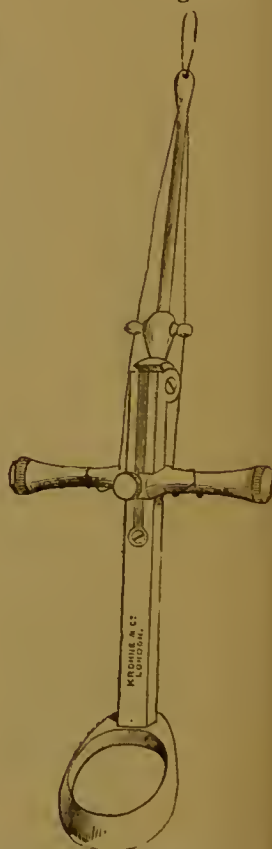


Ecraseurs of Colin and Keene
for Polypi.

Fig. 27.



Fig. 28.



Durham's Modification of
Wilde's Ear and Nose
Polypus Snare.

the tympanum, which was quite exposed, and growing from its roof anteriorly, a small tumour, quite white, on the surface of which I could distinctly trace vessels. I

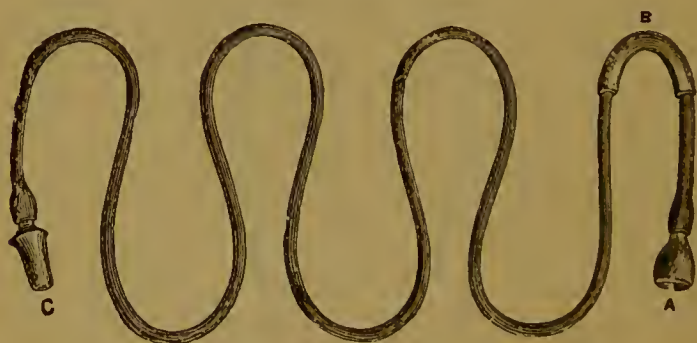
had never before seen a case of this nature, and at once suspected a cystic tumour growing in the tympanum. I made with a fine lance-headed knife an exploratory incision, and found that it entered easily into the mass. I now passed in a Toynbee's forceps and squeezed out the sebaceous contents, part of which came away with the forceps on withdrawing the latter. In order to ascertain the nature of the growth, I again introduced the forceps, and closing the ring on the sac completely removed it from the cavity of the tympanum. There is in the "Atlas" a drawing of the tympanum before and after the removal of the tumour.

Free syringing will bring away any loose portions of polypus not removed by the forceps. I have never had any hæmorrhage to speak of after removal of any kind of polypus. I generally use a little alum water if the bleeding is severe, and this is, as a rule, sufficient to control it. Occasionally it is not possible to remove the entire of one of these vascular polypi at one time, and we have to operate three or four times before the growth is cleanly extirpated. If the polypus is of larger size, globular or pyriform in shape, of the fibrous or fibro-gelatinous kind, we must resort to other means of removing the mass. It is well in these cases to determine as carefully as possible before operating, the size, mobility, and seat of attachment of the polypus. This, as a rule, can be readily done with a probe. Most of the globular polypi which fill up the meatus are easily removed, with the ordinary small curved polypus forceps; but the best instrument is the polypus snare of Wilde—the only difficulty which we meet with is the careful noosing of the polypus close to

its attachment. This, however, is seldom a matter of difficulty, and will be found less so if wire strong enough for the removal of the polypus, at the same time that it can be easily moulded so as to encircle the mass, is used.

The nasal douche is an admirable method of applying a saline solution, such as that of common salt, to the naso-pharyngeal tract. Also mildly medicated lotions can in this way be employed for disinfective purposes, such as weak carbolised solution, Condry's, or chlorinated soda. But it requires caution in its use. Frequently

Fig. 29.



Syphon Douche.

patients have come complaining of the effects, in producing uncomfortable giddiness, headache, faintness, tiinnitus, &c., these results taking place even when the douche was used with every care and precaution possible. Others can bear it with impunity. I have never had a further bad result from the nasal douche than those here stated; but I have always discontinued it when I got those indications of mischief. I have had no unpleasant sequences from the sniffing-up of the salt water from a

saucer or through a tube. Therefore, in those cases where the syphon douche cannot be taken advantage of, I trust to this plan, and the free application of the ordinary laryngeal brush to the orifices of the Eustachian tubes, passing it well up behind the soft palate, the tongue being drawn forward with a napkin. The Eustachian forceps of Turnbull answers the purpose admirably, or the nasal douche shown at fig. 30, which can be used by the patient. In giving instructions for the employment of the syphon tube, the patient should be told to bend the head slightly forwards, inserting the nose-piece (*c*) in one nostril, the steam running out through the other. The vessel containing the fluid should not be more than a foot above the patient's head, the water must be of the body temperature, and while the stream is passing the patient must not swallow, but keep the mouth partly open.

The hand douches (figs. 30, 31) are indispensable in the treatment of post-nasal catarrh and ozænatous states. An admirable douche is the flexible kind to be had of Messrs Arnold, worked with the hand bellows. The soft tube can be bent so as to direct the spray towards the posterior nares or into the larynx. The post-nasal syringe of Mr Lennox Browne (fig. 32) is perhaps the best for the practitioner's use.

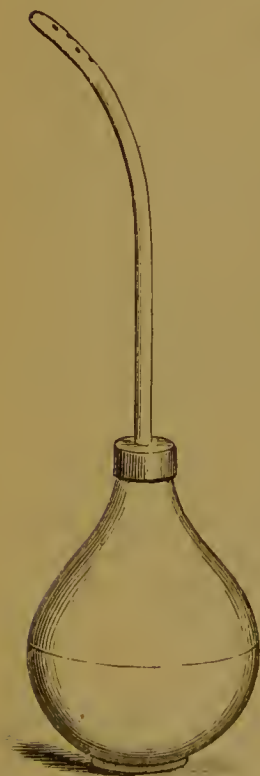
Galvanisation of the membrane in troublesome tinnitus aurium may be tried either alone or in combination with other remedies. (See chapter on Nervine Deafness.)

The best battery to use is Dr Stöhrer's double-celled induction apparatus or Trouve's small battery.

The rheophore (fig. 33) "is placed in the auditory

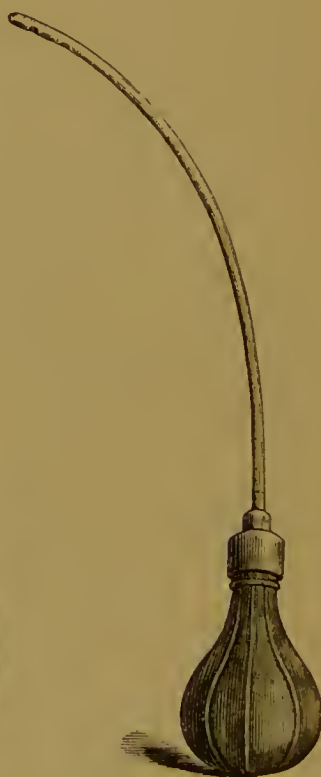
canal, which, being previously half filled with warm salt and water, the metallic wire which projects is insulated by the vulcanite envelope. By means of the metallic screw a connection is made with the conductor

Fig. 30.



Nasal Douche for the posterior nares (soft pewter pipe).

Fig. 31.



Small Nasal Douche (Weiss), (soft elastic pipe).

Fig. 32

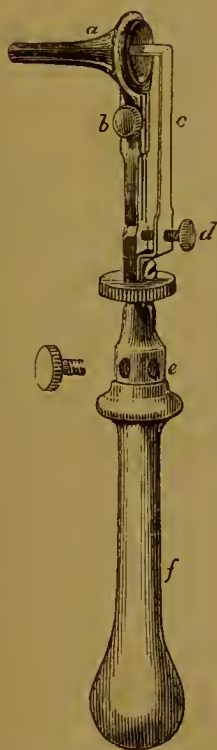


Post-Nasal Syringe (Mr Lennox Browne).

of the galvanic or inductive apparatus, and the circuit is closed by placing upon the mastoid process the other moist sponge, which communicates with the second conductor, and the galvanic current impresses not only

the muscles but the portia dura nerve by means of a

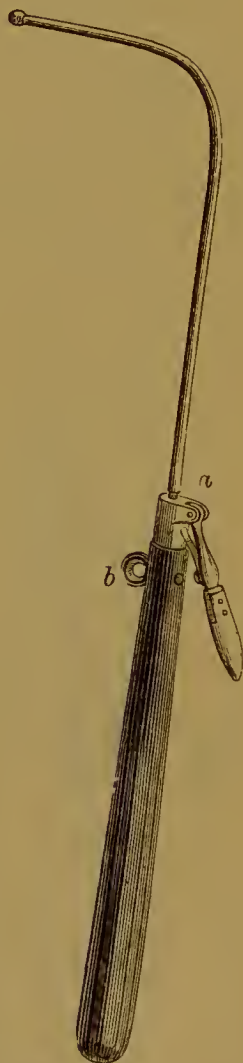
Fig. 33.



Turnbull's Rheophore.

- a.* Vulcanite speculum (insulator).
- b.* Serew to secure speculum.
- c.* Metallic stem.
- d.* Serew which projects wire stem.
- e.* Serew for fixing in the conducting wire of battery.

Fig. 34.



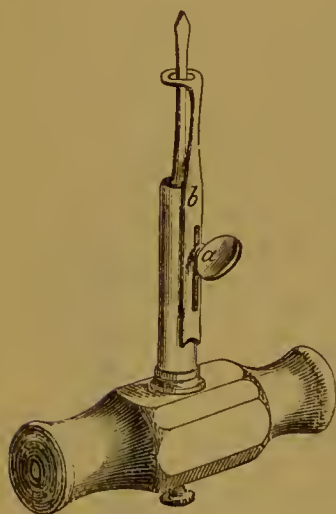
Galvaniser of Mackenzie, reduced for the membrane.

few fascicules of fibres which Wrisberg called the

'portio intermedia,' forming a connecting link between the auditory and the facial nerve." Mr Field uses a vulcanite speculum with a piece of platinum wire which is attached to one of the wires of the battery. A silver probe is employed to complete the current to the membrane.

The preceding figure (34) is a drawing of an instrument made for me by Messrs Khroné and Sese-

Fig. 35.



Hinton's Trephine.

mann. It is simply a miniature Mackenzie's galvaniser for galvanising the vocal cords. The fine probe point can be carried down to the membrane through a speculum, and the entire instrument is insulated up to this point. Communication is made with a battery by a coil of wire hooked on to the loop (b), and contact is made and the current completed by depressing with the finger the lever handle (a). The india-rubber band

which is used by Dr Mackenzie to hook round the neck in galvanising the vocal cords, and which has a piece of sponge in the centre which is connected with the battery, I place round the head, bringing the moist sponge over the mastoid process, hooking the band under the chin; which ever method is adopted, a very mild current must be used at first. Some patients complain greatly of the pain. Others will not bear the rheophore at all. However, it will be found that if too

severe a shock be not given on the first application, the patient becomes more amenable, and the strength of the current can be increased. This instrument can also be used for galvanising the tubal muscles.

Mr Field, of St Mary's Hospital, who has written on the subject, and employed electricity in a large number of cases, attributes its good effects to stimulation of the intrinsic muscles of the ear. In some cases there is, he considers, a paralytic condition of these muscles. It is to restore this function that he galvanises the membrane. Dr Turnbull, whose rheophore, which he kindly had made for me by Kolbe of Philadelphia, is depicted on page 94 (fig. 33), has reported many cases treated successfully by electricity. He approves of its application in those persons in whom we suspect "exhaustion of the brain from over effort or some drain on the nervous system."

To trephine the *mastoid process* it is necessary to

Fig. 36.



Myringotome.

Fig. 37.

Woakes'
Myringotome.

have a guarded trephine. I have used the instrument (fig. 35, p. 96) with satisfaction on a few occasions. The guard (*b*) is regulated by a screw (*a*), and the depth to which we desire to pass the blade is thus limited. It is the aural trephine, used by Mr Hinton.

Paracentesis.—The operation of incision of the membrana tympani is performed with a lance-headed knife (fig. 36) or guarded myringotome, such as that shown in fig. 37. I use and prefer a long fine knife shaped

Fig. 38.



Toynbee's Tympanum.

Fig. 39.



Toynbee's Tympanum.

Fig. 40.



Yearsley's Tympanum.

like a narrow Graafian cataract knife, and about half its size.

Artificial Membranes.—I figure on next page some of the most useful and generally employed artificial membranes. In applying a membrane for perforation, we have to remember the fact, now decided, that it is by pressure on the ossicles, and more particularly on the stapes, that improvement is to be looked for. We do

good, not by closing the aperture, but by the direction of the applied pressure ; this direction being in nearly all cases more or less experimental, we must not be satisfied with a few trials with the cotton wool or disc, but we may have to re-apply it several times to ascertain whether it improves the hearing or not.

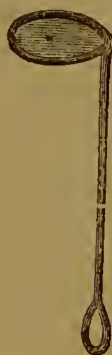
Figs. 38 and 39 are forms of Toynbee's membrane with the india-rubber disc. The former I prefer ; it has a short piece of silk thread attached to it which is easily passed through a little silver tube, and so carried

Fig 41.



Field's Tympanum.

Fig. 42.



Turnbull's Tympanum.

down to the aperture in the membrane, the tube is then withdrawn, and the small piece of silk thread which remains is not perceived in the ear.

Fig. 40 represents the membrane of Mr Yearsley, and will be found better than any other kind in many cases ; it is a simple little egg of cotton wool which has a thread attached to it, and it is carried down as in the last case by a tube or inserted by a fine forceps. The ball of cotton wool can be first moistened with a solu-

tion of sulphocarbolate of zinc in glycerine (iv. gr. ad. ʒj). It may at times be left in for some days; whereas it is better to remove Toynbee's every night.

Fig. 41 is Field's membrane. The following are the advantages claimed by Mr Field for this kind over those of Toynbee or Yearsley:—"It is simply a combination of Toynbee's artificial membrane, viz., a thin disc of india-rubber mounted on a fine silver wire stem, with Yearsley's cotton wool. In my instrument the wire is carried beyond the india-rubber for about a quarter of an inch, and terminates in a second disc made of flannel. The space between the two is filled up with a small portion of Dr von Brun's wound-dressing cotton wool, which is absorbent, and so takes up and communicates to the flannel disc any medicated solution which it may be desirable to apply.

"Its advantages are the following:—

"1. It does not irritate the membrane, and being very soft is not likely to injure it.

"2. It is made of cotton wool, which is absorbent; lotions can by its aid be constantly applied with much advantage.

"3. By thus keeping the part clean, the membrane gets into a healthy state, and the perforation heals.

"4. The hearing distance is improved.

"5. It is not liable to leave the india-rubber disc in the meatus.

"6. It is easily used and does not require the forceps as Yearsley's cotton wool does."

In a communication on a new artificial membrane, in the "Philadelphia Medical and Surgical Reporter," December 1876, Dr Turnbull makes the following

observations, which are of so practical a nature that I am glad to insert them here. His membrane is shown in fig. 42. It will be seen that the stem is at the side, not in the centre of the disc.

The first important improvement was to make the stem of steel, also the support of the disc of the same material, so as to act as good conductors. The second improvement was to cover the whole with the thinnest rubber by means of heat, so as to protect the metal from the action of the discharges. The third is a delicate metal wire, supporting the thin rubber drum, and preventing curling up. The stem can be long or short, as desired, as it can easily be cut with a strong pair of scissors.

“ There are a few practical hints which are well to be remembered when artificial membranes are employed. In introducing the plug of cotton wool, always moisten it with water, glycerine, or a weak solution of sulphate of zinc in water. The use of a small pair of tweezers, or small forceps, assists the surgeon or patient to place the cotton in the right place. One or two trials may be necessary before the exact spot is found. A disc of rubber or the plug of cotton wool is not, like the new artificial drum, susceptible to vibrations of sound. In applying the new membrane, we must have it made of the proper size. Before introducing, moisten the drum portion only, and carefully, with warm water and glycerine, by means of a brush, and then press it gently down the meatus; when it has arrived in the right place, there is generally a little click, from the escape of the compressed air. No force must be employed in the introduction, and we must be guided by the sensations of the

patient as to the hearing being improved or not. The pledget of wool or new artificial membrane should not be so large as to entirely fill up the meatus, or perforation. An open space should be left between the wool and the walls of the meatus for sound to pass to the tympanum. The cotton wool or artificial membrane should be taken out at night, If there is any odour or

Fig. 43.

Aural probe
of Author.

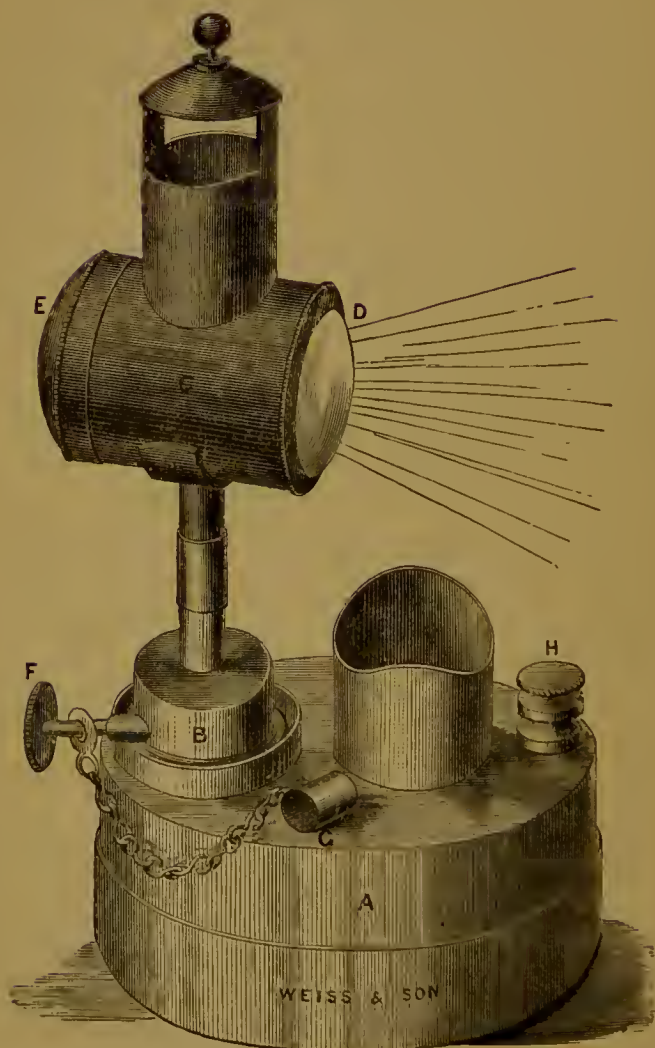
pus on either side, it must be washed off; and in the case of the cotton, it had better be renewed with fresh material. The artificial membrane must be covered from extreme heat, dust, and very dry air. If granulations are found on the surface of the middle ear, projecting through the perforation, these must be removed by the use of a small portion of powdered sulphate of copper on a brush, or by dipping a long camel's hair brush in water, and applying it to a crystal of sulphate of copper, and then to the granulations, after wiping out any pus or adherent mucus. If the bone is not involved, and these granulations cover the whole surface of the perforated membrane, the strong liquor plumbi, or solution of sulphate of zinc, can be employed by the patient at night, and applied after cleansing, by means of 'Clarke's donche.' This application can also be made with the long brush, passed well into the meatus from time to time, until the surface is healthy. Another important point not to overlook is the relief of any obstruction in the Eustachian tubes, either by Politzer's method or with the catheter."

The annexed probe made for me by Messrs Weiss, will be found very useful for cleaning the membrane. It is simply a double silver probe with a screw thread at the point mounted in a handle* Cotton wool can be rolled round the roughened end, and by it all discharge can be lightly cleaned from off the membrane and meatus. It is useful also when we desire to touch a perforation, or the remains of a polypus, with any solution or acid.

The small portable lamp (fig. 44), made by Messrs Weiss, for ophthalmoscopic and laryngoscopic purposes, will be found most convenient for taking to the country when summoned to a case in an emergency, and equally useful for examining an ear.

* Probe point unscrews at (α).

Fig. 44.



Weiss' Portable Lamp.

CHAPTER IX.

WEBER LIEL'S EAR MICROSCOPE AND KONIONTRON.

Dr Weber Liel thus describes the object and method of using this instrument devised by him. The purpose of the ear microscope is twofold :—(1) to show distinctly the greatly magnified membrana tympani, and in cases where a defect of the membrane exists, the part of the exposed cavity ; (2) to demonstrate the oscillations of the membrane and malleus under normal and abnormal conditions, *i.e.*, to show not only morphological, but also functional alterations with a micrometer.

This method of examination is based upon experiments made on the dead body, as follows:—If we sprinkle a little starch on the membrana tympani and malleus, and then concentrate the light of a lamp on it by means of a lens, the particles of starch appear as so many bright spots.

The sounds of a pipe, or of the human voice, are conveyed through a caoutchouc tube to the external meatus, while the membrane is under observation through a microscope of from 12 to 15 magnifying power. We perceive under the influence of the waves of sound that the starch spots are lengthened into longer or shorter bright lines according to the strength, the height, and the depth of the tones. This lengthening

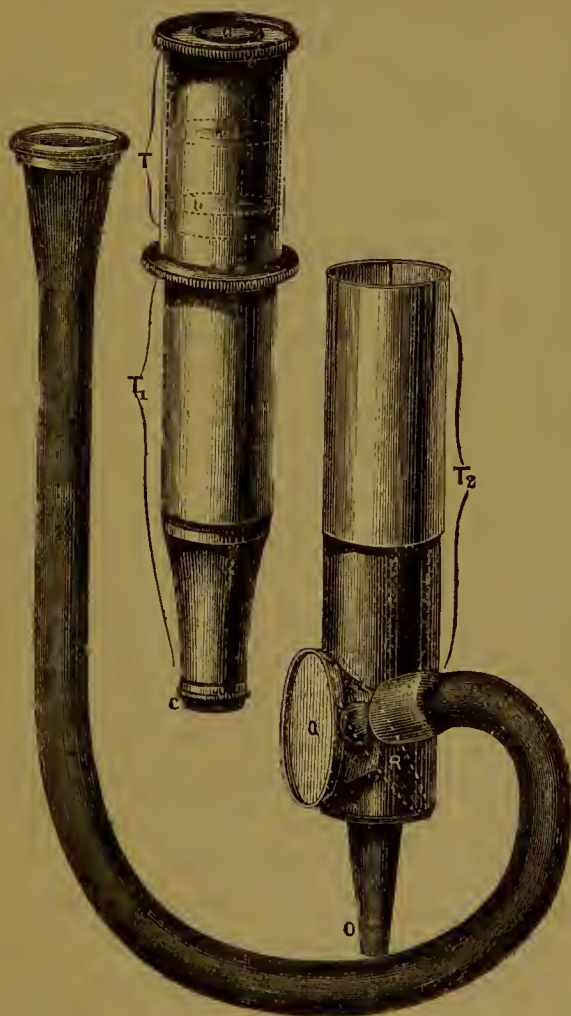
of the spots indicates the excursions of the single parts of the membrane and malleus (and if there is a perforation of the incus and stapes). The length of the bright lines, *i.e.*, the amplitude of the excursions, is measured by a glass micrometer which is added to the "ocular" of the microscope. Under normal conditions the different parts of the drumhead and malleus show different sizes of the excursions under different trial tones. Generally the prominent superior portion of the membrane shows the smallest excursions, the prominent lower parts larger ones. The amplitudes of the excursions still increasing under the influence of the same tone in the lower and posterior parts behind the malleus, and still more so in the superior and posterior parts; atrophic membranes often exhibit extravagant excursions. On the contrary, adherent portions of the membrane yield very reduced excursions.

If the tensor tympani muscle is stretched in the subject, all excursions become altered in direction and reduced in size. Other results will follow if one of the ossicles is loaded with inspissated mucus, &c. On the result of these experiments is based the method of investigation through the microscope.

This instrument must become more valuable when aural surgery has made more positive physical progress. Even now, when much preparatory physiological and physical work in this direction is not yet solved, the investigations by means of this instrument show important diagnostic results. We can see peculiarities of the membrane which we did not look for in the general method of investigation, in a clear, simple manner, especially the character of the folds, cicatrices, and

accumulations of secretion in the tympanum. The ear microscope is given in the woodcut one-third its natural

Fig. 45.



size; it allows a thirteen-fold magnifying power, and we can see, at a time, a quarter of the membrane.

The ear microscope consists of two tubes T^2 and TT ,

the tube with the microscope TT¹ and a second tube, T² in which a reflecting mirror is inserted, in the latter TT¹ can easily move. In TT¹ is inserted the movable ocular, the glass micrometer, the collective and the objective. In T² (R) shows the reflecting mirror in the inner part of the tube. The quicksilver coating of the centre of the mirror is removed, but the glass itself is not pierced.

(G) shows the side opening of the instrument through which the rays of light fall upon the inner reflector, this opening is closed by a lens. (O) is the ear speculum surrounded by caoutchouc on the point. In the tube T² under the reflecting mirror is inserted an india-rubber tube through which we can speak or sing, or the tones of pipes may be introduced when the speculum is inserted air-tight into the meatus. By it we can also condense or rarefy the air (as we do by Siegle's speculum), so that we can thus establish the degree of mobility of the membrane and the malleus. We thus see the astonishing power of motion of the membrana tympani under normal conditions, even if the mouth of the investigator is held half a foot away from the opening of the india-rubber tube, he can see that under the influence of the breath the patient's drumhead shows distinct movements.

In order to make use of the ear microscope much practice with it is necessary.

First, T² with the speculum is inserted into the ear, and if the investigator finds after several trials that the drumhead is well illuminated, and all is well placed, then TT¹ may be cautiously inserted in T² as deep as the eye of the investigator demands; if all is now right

we can rarefy or condense the air, and introduce sounds, &c.

The Koniontron.—There is no doubt that ordinary ear-catarrh can be treated by the catheter, air douche, &c. But in cases where old inspissated and viscid accumulations are present in the folds of the membrana tympani, in the spaces between the malleus, in the anterior and upper walls of the tympanic cavity, in the niches of the labyrinth, or around the articulations of the ossicles, experiments on dead and living subjects show that the simple air douche, and the ordinary methods of treatment are not sufficient to wash them away. If the passage through the Eustachian tube is difficult, even the strongest common air douche loses much of its power through the increased friction, and the injected fluid is sent, not where it is intended, but to the bottom of the tympanic cavity or into the cells.

We can only hope by a stream of air combined with some strong solvent fluid directed immediately on the affected parts (lying sideways) to dislodge the accumulations.

A long continued chronic catarrh is often followed by decreased mobility of the ossicles and of the membrana tympani. When this happens, single insufflations, no matter how strong, when driven in at a distance through the narrowed Eustachian tube, have very little effect. In order to obtain increased mobility of the conductive apparatus, it is necessary to resort to short insufflations so as to secure the pressure of the stream immediately into the affected place, one advantage of the Koniontron being that fresh air is passed into the

tympanic cavity, and its effect is not merely to condense the air as in the ordinary douche. Most surgeons (says Weber Liel) who have seen the effects of the Koniontron will admit that it is almost indispensable to an aurist, and that it would have been more generally adopted if its use were as easy to learn as Politzer's method. It is most efficacious in removing old inspissated accumulations, in stretching old adhesions, and in freeing old folds.

The fluid that I use in it is a solution of carbonate of soda, dissolved till it has a slightly alkaline taste. From experiments on animals and experience in some thousands of human cases, I have found that this drug is the only one that does not cause pain and inflammation in the tympanic cavity.

The Koniontron is a small instrument composed of three parts.

(1.) The tympanic catheter (*f*) (described in 1866 in "Deutsche Klinik") is a thin flexible catheter spun of strong silk and covered with india-rubber (length 16-18 cm., thickness $1\frac{1}{4}$ - $1\frac{3}{4}$ mm.). Some are made with the aperture in the side of the catheter quite close to the end.

(2.) The *Pravaz* syringe (*a*, *b*), made from hard caoutchouc.

(3.) The middle piece (*o*) is screwed on the syringe, and joined with a tube and balloon; a bone top is inserted into the upper part to join it to the tympanic catheter.

After washing out the naso-pharyngeal cavity, insert a silver catheter into the mouth of the Eustachian tube, then push the flexible tympanic catheter through it, and

by rotating gradually pass it onwards into the tympanic cavity; the lines (*i,i,i*) show how far the flexible catheter is to be introduced. Other lines indicate the lateral opening of the catheter which is to be turned towards the parts which have to be washed out.

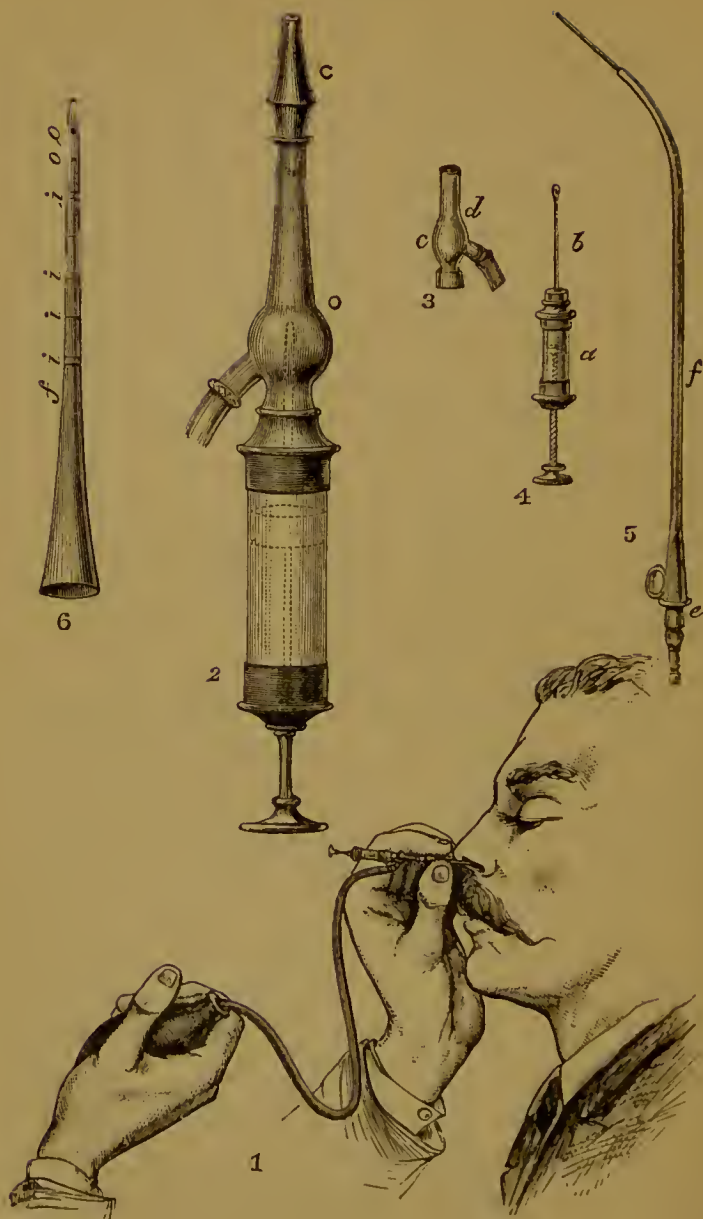
(A more detailed account is given in Dr Weber Liel's book "Progressive Deafness," 1873.)

The tympanic catheter being *in situ*, and the silver catheter fixed, either by the surgeon as in the diagram, or by the patient, who must press it with his thumb against the septum-narimum, the syringe with the middle piece must be joined to the tympanic catheter by the top (*e*).

The introduction is generally successful, because often there is no swelling, but only a collapse of the walls of the Eustachian tube, and therefore I use the tympanic catheter alone for diagnostic purposes, and also very often to suck out the fluid from the tympanum.

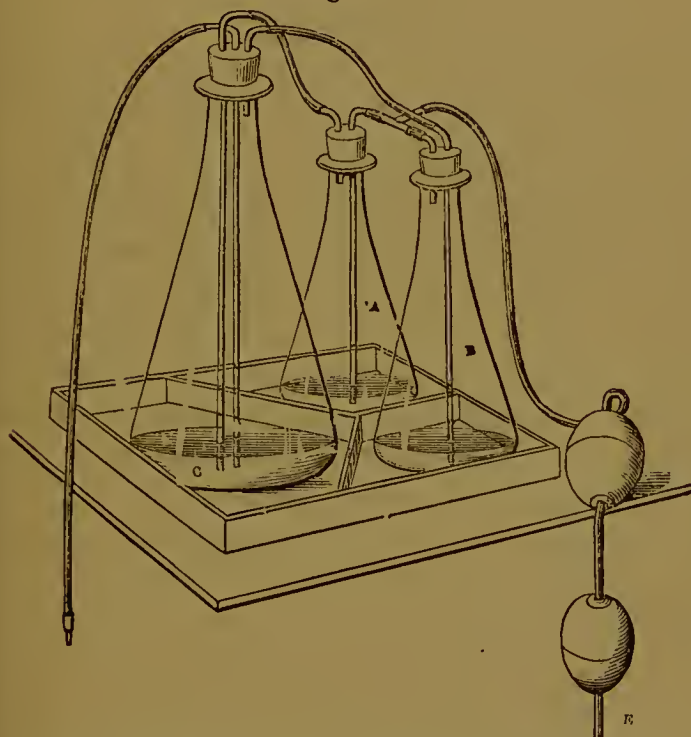
Medicated Vapours.—I do not employ medicated vapours much myself in the treatment of affections of the tympanic cavity. The two I think most useful are iodine vapour and that of chloride of ammonium. I think the immediate generation of this latter vapour by means of the ordinary triple bottle apparatus, from liquor ammonia with hydrochloric acid, is perhaps the best plan, and the simplest to adopt. It can be had of Messrs Krone & Sesemann. My friend Mr Swanzy, of the National Eye and Ear Hospital, Dublin, after considerable experience of this vapour, used in this manner by means of the catheter, speaks well of its action. The vapour is passed direct from the receiver into the tympanum by means of a tube attached to the Eus-

Fig. 46.



tachian catheter. The bag for iodine insufflation, with a cavity in the pipe that holds a small piece of sponge, can be had of any instrument maker.

Fig. 47



A, Bottle containing hydrochloric acid; B, Bottle containing liquor ammonia (B.P.); C, Large bottle containing water; D, India-rubber tubing with tip for catheter; E, Handbag to expel vapours into large bottle where combination takes place.

CHAPTER X.

DISEASES OF THE AURICLE AND EXTERNAL MEATUS.

Cerumen.—Free syringing is generally all that is required for the removal of this common and troublesome cause of deafness. Often the mass does not come away until a considerable time has been spent in syringing; but it will always ultimately yield. The removal of a plug of impacted wax is often expedited or effected, after syringing a little time, by carefully grasping the mass with the rectangular forceps, and withdrawing or loosening it. A little potash and glycerine dropped into the ear for a few nights will help to soften hard coats of wax and epithelium. After a portion has been removed, and when the grub of cerumen or waxy cast of the meatus is washed out, the canal should be examined with a speculum; much harm may be done if this step be not attended to, the healthy membrane may be forcibly syringed and much mischief accrue. On the removal of cerumen, the membrane is generally seen, dull, with an absence of transparency, and the surface of the malleus has an injected look; the collection being removed, an interval of a few days will generally set things to rights, and if this be the sole cause of the symptoms, nothing further is necessary. If any tinnitus or pain persists, or if the deafness is not relieved, we must suspect other mischief, and proceed to examine the ear closely. The usual

complaint made by patients suffering from "wax in the ear" is that of deafness, with a stupid feel and some form of tinnitus; I generally insufflate a patient after removal of wax. I may here say that most ridiculous errors are often committed from the non-recognition of this simple cause of deafness. Nothing can be more exasperating than for a patient to return a long distance to a surgeon, and find that the source of all his blistering and leeching, and perhaps physicking, lay in a mass of easily removable wax; yet this often occurs. The characteristic black shining surface of the wax can hardly be mistaken, with any degree of care. At times the surface has a peculiar lustre, and may even give to the inexperienced eye the idea that it is the membrane, but it is only necessary to mention this, in order to prevent any surgeon from falling into so unfortunate an error. Two imprudent practices may be referred to in connection with this matter. First, the habit of inserting picks, rolls of towels, &c., into the ear, to cleanse the meatus. This can only do harm, and ensures the consolidation of any cerumen in the canal, and its impaction on the drum. Secondly, the fashion of placing cotton wool in the ears—the presence of the wool is frequently overlooked. It will be sufficient to mention that not long since I removed three layers of wax and two of cotton wool from the ear of a gentleman who was completely oblivious of the presence of the wool.

Abscess in the Meatus.—Furuncles and abscesses in the external meatus, occurring either as the result of exposure to cold, damp, or the presence of a foreign body, accumulation of wax, &c., are very common. They occur in persons of all types of constitution, often in

the midst of robust health, and at all ages. The symptoms are characteristic—severe pain of a shooting nature, increased at night, with some slight attendant fever and constitutional disturbance. This pain is of a radiating character, extending to the side of the head, and aggravated often by movement of the jaw, as in eating. The entire ear becomes sensitive to the touch, the patient shrinks from examination. The abscess may occupy any portion of the canal, and vary in size from a minute boil situated on some part of its wall, to a considerable swelling which may block up the entire meatus. The intensity of the pain and the symptoms vary according to the situation and extent of the inflammation: whether it be restrained by the bony boundary of the canal and in proximity to the membrane, or seated more externally in the cartilaginous portion. The advent of the attack is frequently marked by a certain amount of tinnitus.

The presence of the abscess is easily recognised. It is not often necessary to use any speculum, and this should be avoided, if possible, as its employment causes unnecessary pain. The meatus may be entirely closed by the swelling. This gives rise to a possible source of error, yet one which with any degree of care should never be committed. Quite recently, I found it difficult to persuade a medical man of some experience that such a case was not one of polypus. (*Vide* "Atlas.") I have known an instance where an attempt was made to snare an abscess in mistake for a polypus. It is needless to say that with a little care, and if any doubt exists, an examination with a probe, such a mistake could not result; the complete continuity of the abscess with the

wall of the meatus immediately distinguishes it. It is rare for the inflammation to resolve itself, and generally in periods varying from two to six or eight days, pus forms and is discharged. The treatment consists in depletion with leeches (two or four) applied over the tragus or in the meatus : in the early stage of the disease warm fomentations, decoctions of chamomile and poppies answer well, and steaming the ear. Hinton and Roosa caution against the use of external poultices, the latter recommending a small conical linseed poultice introduced into the ear. It is well to emphasize this caution. I have seen great harm done by the continued use of large poultices applied to the ear. The small conical bag of linseed, as just mentioned, is the kind I always employ. I rely entirely on constant fomentations* with poppy water, and sometimes benefit may be had from a blister applied over the mastoid process, in the early stages. I have often found vesication of great use in allaying the pain. I have applied also with benefit subcutaneous injections of morphia. If the meatus be not blocked up, warm injections of carefully strained poppy water, frequently repeated,† will be found grateful. When the abscess has formed, the early evacuation of pus, by an incision carried well into it, is the only treatment, this incision being followed by careful attention to the meatus and membrane. On this latter point it is not possible to speak too strongly. Many are satisfied with the relief they give their patient with the first incision, and do not continue their care

* Maw's aural douche will be found most convenient.

† I prefer the syphon douche for these cases ; with it a gentle stream may be made to play on the meatus.

of the canal for some days subsequently. The result is frequently occlusion of the passage, with some epithelium and discharge, perhaps recurrent abscess or implication finally of the membrane. I keep the passage well cleansed, using some mild astringent lotion, such as sulphate of zinc, chloride of ammonia, sulpho-carbodate of zinc, or borate of soda with glycerine, and warm injections for several days. As abscesses are particularly likely to recur, it is well to warn the patient of this tendency, and so avoid the unpleasantness which sometimes arises from impatience at the prolonged nature of the infection. It is in these recurrent cases that the continuance of poulticing does such mischief, relaxing the parts and maintaining a chronic state of congestion of the vessels.

Weber Liel notices the prevalence of abscess of the meatus in spring time; he advises early and full incision down to the periosteum. Thus the morbid process is shortened. He also recommends a spirit bath of alcohol and weak solution of bichloride of mercury in the commencement of the inflammation; the patient lies on the side and the ear is filled with the alcohol. This has a hygeometric and anæsthetic effect. Dr Weber Liel also injects a five per cent. solution of carbolic acid (2-4 drops), subcutaneously into the furunculus. This he finds lessens the tension and pain. He then uses the alcohol bath for one hour. The injection is repeated if necessary. Caution is required, and only a fresh and pure solution of carbolic acid should be used. Pain is thereby arrested; the inflammatory process is cut short and recurrence anticipated.

At times abscess in the meatus assumes very formidable proportions. This is particularly so in those cases

where there is frequent recurrence of the abscess. I have at present attending me a patient who came with the meatus completely closed with abscesses; on the opening and reopening of these and the subsidence of the inflammation, an enormous quantity of cerumen and epithelium came away, the membrane being perforated behind the mass. A gentleman, a little time since, who had suffered for several months with abscess of the meatus, consulted me: the inflammation extended to the mastoid cells and tympanum, periodical attacks of violent pain, redness and swelling of the mastoid and the parts above the auricle supervened, and then a copious discharge of pus took place from the meatus. On and off these attacks were attended with alarming constitutional symptoms—violent headache, coated tongue, exaltation of temperature, rapid pulse, and sleeplessness. On the escape of the pus all these symptoms subsided. I believe that all the mischief in this case arose from the want of a free incision in the first instance, and the imprudent and prolonged use of large poultices.

This patient died of brain symptoms about one year after these notes were made,—no autopsy would be permitted.

Exostosis in the Meatus.—These tumours frequently occur without any assignable cause. They may be congenital. I have several times seen them connected with a gouty history and family. With care exostoses cannot be mistaken for any other swelling occurring in the auditory canal. These growths are hard and painless, and only produce uneasiness from the deafness that gradually increases, and which frequently is sudden

in its onset from the complete closure of the passage with cerumen. The skin covering the growths is perhaps slightly pinker than that of the meatus; at other times the reverse is the case, the integument being quite white. As to treatment, I believe in preserving the patency of the chink, careful syringing, and the topical application of agents, calculated to reduce the congestion of the membrane lining the canal. Electrolysis has been tried with success (Clark). A drill, similar to that used by dentists, has been employed to bore through the exostosis, and sea tangle subsequently employed to dilate the passage. Mr Lennox Browne has reported in the "*British Medical Journal*" (Dec. 22, 1877), successful cases of exostosis treated by the dentist's drill, and subsequent avulsion of the exostosis. See also case reported at the Otological Congress by Dr Matthewson of Brooklyn. Mr Field, of St Mary's Hospital, also operated most successfully on a medical gentleman by the drill, and with a perfect result.

Mr Field says, in detailing the particulars of this case:—"After working steadily for an hour and three quarters I succeeded in drilling through the greater part of the growth. The operation was rendered difficult, not only from the extreme density of the tumour, but also from the fact that the growth was deeply seated, and was repeatedly hidden by the blood persistently filling the meatus." The patient was under chloroform.

One month subsequently Mr Field operated on the left ear, the exostosis being "worse than the other for removal, being of larger size." This operation had to be repeated. The only ill result was an attack of "violent inflammation in the membrana tympani, which

perforated." This yielded to treatment. A discharge of pus continued from the meatus for some time, which finally ceased. I have accidentally seen this case myself about one year since. The recovery is complete. The hearing is excellent. I look on it as a perfect triumph in operative aural work.

In the "Lancet," January 8th and 15th, 1881, Mr Field details the particulars of other cases treated by him successfully by the drill. Mr Field has shown me the shield he uses, made for him by Messrs Weiss & Son, and which admirably protects the meatus and membrane. Mr Field gives the microscopical characters of an exostosis (not ivory) removed by him from a young lady, which he did by boring a hole through the base of the tumour and then removing it with a forceps. She complained of great pain when the bone was touched. I have, as remarked by Mr Field, never found an ivory exostosis painful during examination. It is usually found in both ears. It frequently leads to complete occlusion of the canal without pain. The microscopic features of the softer exostosis (under 75 diameters) referred to "showed that the growth is made up of material similar in structure to newly-formed bone. The free surface is bounded by fibrous membrane raised into small papillæ, and covered by squamous epithelium. In the substance of the tumour trabeculæ of bone form a sort of spongy tissue, in the meshes of which a vascular medullary tissue is contained. Magnified 350 diameters, the fibrous membrane shows no nerves or glands, and only a few small vessels. The layer of bone immediately beneath it is more condensed and thicker than the central portions. Its lamellæ

are parallel to the surface, and contain but few bone corpuscles. In the central portion of the growth the trabeculæ are thinner and limit irregular oval spaces. These are filled in some parts with a richly nucleated fibrous tissue containing numerous spindle and round cells. In other parts there is but little fibrous tissue scattered in the midst of round cells. No giant-cells are seen anywhere. The vessels consist chiefly of very large thin-walled tubes, resembling dilated capillaries. They are well filled with blood. Here and there a few arterioles are visible."

Mr Field goes on to say that "the tumour differs from a true ivory exostosis in containing cavities filled with medullary tissue, and hence it may be termed "a spongy osteoma," as defined by Cornil and Ranvier. Some exostoses of pedunculated form may be removed by wire; in these suppuration is generally plentiful, and occasionally a polypus arising from the exostosis precedes its appearance, as in a case I published. Kramer has described an interesting instance of a polypus, in the form of a stalactite, so hard that a knife could not cut it. Clark of Bristol has removed by electricity an exostosis, which followed the growth of a mucous polypus, from the right ear of a girl nineteen years of age. But Bonnafont, I believe, was the first surgeon who dealt successfully with an ivory exostosis causing complete closure of the meatus. This was accomplished by means of graduated styles, and by the use subsequently of nitrate of silver. I have found this method of treatment almost unbearable, from the intense pain to which it gives rise. Tröltsch has successfully used laminaria to enlarge the opening between

the growth and the wall of the auditory canal. Miot adopted another plan; he trephined the tumour with a very fine instrument in two or three places, set up sup-puration, and dead bone afterwards came away in sufficient quantity to allow the membrana tympani to be seen."

Mr Field notices the connection between ivory exostosis and sea-bathing, instancing the amphibious habits of the Hawaiin islanders, in whose crania (Professor Wyman) exostoses in the external meatus are so common. In the instance of the gentleman whose exostoses are shown in my aural atlas this may have been the cause, as there was no gouty history, and for over twenty years, winter and summer, he had gone in bathing, and often two or three times in the day. I have recently seen another severe case of exostosis in the person of a gentleman very fond of sea-bathing. At the same time, I have some patients who come to me regularly to have their ears inspected, where there are well-marked exostosis, yet who have never been in the habit of bathing in the sea.

The severity of one of Mr Field's operations may be judged from this brief description:—On January 29th the patient was placed under chloroform, and I proceeded to drill through the growth in the right ear. Here let me state that to perform the operation I have found that it is necessary to have the help of three assistants—one to give chloroform, one to work the treadle of the engine, and one to hold the steel guard in the ear, which I used to prevent as much as possible any risk from the slipping of the drill when in motion. Help is required also to sponge and to syringe with cold water

to keep away the blood which fills up the meatus with great persistency, and often prevents, for a time, a view of the bone. I worked away steadily for fifty minutes, and at last succeeded in getting a fine drill through the growth. For the reasons before assigned, the greatest caution is necessary, and the operation would require considerable time, even if the part to be pierced proved to be less solid. On February 11th I enlarged the opening, the patient being forty-five minutes under chloroform. On March 2d I operated for fifty-five minutes on the left side in a similar way, and in this ear I found two subsequent operations necessary—one on March 24th, lasting forty minutes, and one on April 17th, half an hour.

Mr Field thus accurately describes his method of operating:—The patient is placed on a high couch 4 feet from the ground, with his head resting on a pillow, and the side to be operated on must be well propped up towards a good light. It is necessary to have the patient placed as high as this, as the dental engine is adapted to a high chair, and so consequently the drill will not reach anyone placed on an ordinary sofa. The handle of the drill or the holder, of course, might be made longer, but that would involve constant stooping on the part of the operator, which in such a long operation is best avoided by this high position of the patient. Chloroform is then administered, and an assistant holds a steel guard in position round the growth, the guard having been made beforehand to fit the exostosis. Messrs Weiss and Son made me, for my first operation, and which answered admirably, a soft metal guard of copper, very thin, and small enough to pass between the growth and

the anterior wall of the meatus. In fitting it, I bend one end to the exact shape to pass behind the growth on the right side, and the other end to pass behind and exactly fit the left exostosis. When I have thus got the shape of both growths, a guard exactly corresponding to the softer metal is made of steel, which at the time of the operation can be readily placed in position, and prevents danger in no small degree. I generally begin with a small drill, and subsequently enlarge the opening with a larger instrument.

I have not found it necessary to cut through the skin first before using the drill. I proceed at once to make a small hole by the side of the steel guard, avoiding the base of the tumour, as there is nothing to indicate the direction, and a slip would be attended with the utmost danger to the life of the patient. It must be remembered that very often the operator is working in the dark, for whatever means he may adopt blood will be sure to fill up the meatus. If he succeeds even in making a way through the base of the growth, he may find himself in a very unexpected and unenviable position. With the steel guard firmly fixed in place, I have found it best to work very slowly, constantly taking out the instrument to sponge or syringe away blood, and thus for an instant or so get a view of the bone. The operation, necessarily very tedious, is by no means an easy one, and even with much care and caution bestowed upon every detail, unforeseen *contretemps* may arise.

In consequence of the absence of an assistant in one of the latter operations, Mr Field had to operate and hold the guard himself. The consequence was that the

guard slipped, the membrana tympani was injured, and slight facial paralysis was the result. The result, however, was most satisfactory.

Dr Cassels, who has devoted so much special attention to this subject, has arrived at these conclusions (International Congress, 1881):—

“The osseous tumours of the external meatus are of two kinds, the one, named hyperostosis, being a hyperplasm; the other, exostosis, being a new growth. These differ from each other in origin, site, shape, structure, and number.

“Hyperostosis is never seen till the osseous meatus is completely ossified; exostosis appears before the complete ossification of the meatus. Exostosis is found arising from a point near the junction of the osseous canal with its cartilaginous portion; hyperostosis is seen only in the inner, or osseous end of the external auditory canal. Hyperostosis is always conical in shape, never pedunculated; in exostosis, on the other hand, there is always a pedicle, and its shape varies. Hyperostosis is of ivory hardness; exostosis before complete ossification has taken place in the tumour, can be pierced to a varying depth. Hyperostosis is not movable on pressure; exostosis is slightly movable, even when complete ossification has taken place. Hyperostosis is often seen without any other disease of the ear, and if an ear disease exists, there is no causative relation between them; they exist altogether independently, and apart from each other. Exostosis is nearly always complicated with another affection of the ear, past or present. Hyperostosis, therefore, may exist in the meatus with normal hearing. Exostosis, on the

other hand, is almost always attended by a defect in the hearing. The deafness which accompanies hyperostosis, in the absence of any other disease of the ear, is due to the size of the growth, and is mostly mechanical, or it is due to the presence of débris between or behind the tumours. In exostosis the defect in the hearing may also be mechanical; this defect, however, is generally due to ear disease, either past or present.

"The operation for the removal of hyperostosis is only justifiable when its mechanical presence has been ascertained to be the sole cause of the deafness, or when a coincident ear discharge exists, the escape of which may be hindered, or altogether arrested by the presence of the tumour. The commonest cause of deafness in hyperostosis is the presence of débris around the tumours, either cerumen, epidermic masses, or other matters, or to mechanical irritation and inflammation of the tissues that cover them. The hearing is mostly restored on the removal of the débris or inflammation. The operation for the removal of hyperostosis is best effected by a mechanical drill, such as dentists use; this is the safest method of removal.

"For the operation of the removal of an exostosis a gouge is the best instrument, because the tumour can be removed at one operation, whereas a hyperostosis usually demands several operations, as well as separate sittings, for its complete removal, when this is possible. There may be several hyperostoses in an ear, but hardly ever more than one exostosis. Both classes of tumours may exist together in the same ear."

Of the agents I have found most useful in exostosis, I may mention especially nitrate of silver, chromic acid

and chloride of zinc, carbolic acid, alcohol and glycerin, syringing with alkaline solutions, injections of iodide of potassium, or hydrochlorate of ammonia. The aural probe is most useful for cleansing the chink and applying solutions. A camel's hair pencil, cut so as to leave only a few of the central hairs, answers admirably for the patient to use himself. Whatever means be adopted, *the great secret is to ensure perfect cleanliness, and to prevent, if possible, complete closing of the canal.* I have given largely to patients affected with exostosis iodide of potassium, but I cannot speak very favourably of the results.

In the "Atlas of Diseases of the Membrana Tympani" are some drawings of exostoses. Two of these plates there represented were taken from the ears of a medical gentleman advanced in life who came to me quite deaf from occlusion of the meatus.* By the treatment I have recommended, and constant attention, the spaces between the growths, at first mere chinks, were gradually enlarged until the membrana tympani was visible—hearing was quite restored, and remains so.

Aspergillus.—As in many other instances, the presence of the aspergillus in the ear, both in the external meatus and tympanum, was overlooked or regarded as a comparatively rare occurrence, until recent observers have so carefully pointed out the clinical features of this affection. In the United Kingdom, Dr J. Patterson Cassels, of Glasgow, the eminent aurist, has devoted much time to its etiology. On the Continent, Paccini, Kramer, Schwartze, followed Mayer in describing the fungus; and of late

* Mr Field, who saw this patient subsequently, refers to the case in the paper before quoted.

years Politzer, Weber Liel, Gruber, Roosa, Orne Green, and others, have carefully recorded cases and detailed the most successful methods of dealing with the fungus. Any one now treating aural patients must be ready to recognise this parasitical tenant of the human ear, as he is certain to meet with it every now and then in affections of the outer and middle ear.

In some very interesting communications made during the past few years, Dr Löwenberg, who has paid special attention to this subject of otomycosis, or the presence of parasitical fungi in the human ear, has shown that these spores originate and develop under special conditions favourable to their growth. Dr Löwenberg says:—"It is chiefly with the object of proving the possibilities of engrafting this, a very painful disease, upon the one for which the patient demands our care, that I write these remarks. In a great number of cases the affection is provoked by the introduction of an oily substance into the external ear, such as olive oil, oil of almonds, &c.; at times lard, balsam, or pomade. In employing these oily substances, it is not sufficiently remembered that they all undergo rapid decomposition once they remain exposed to the atmosphere, even at an ordinary temperature; how much more so at the more elevated one of the auditory meatus. Oils contain in solution azotic substances which, under the influence of the oxygen of the air, provoke special fermentation, becoming rancid. This raises the temperature rapidly; the neutral fatty matters contained in the oil are changed into glycerine and fatty acids. Thus the spores of the musty fungi, which are abundant, are provided with all that is necessary for their germination,

viz., oxygen, watery vapour (in the air), sufficient heat, organic decomposition, and the acidity which favours their development. The filaments of the mycelium grow rapidly. The acid products of the decomposition on the one hand, and the vegetable foreign body on the other, irritate the ear and set up this inflammatory process, causing the watery secretion, and exciting the formation of the organic azotic substances that are so easily assimilated by these cryptogames.

“The conviction of the hurtful effects that oily substances exercise in these cases—a conviction shared formerly by other authors (see an interesting memoir by M. Bezold)—has made me adopt the following rule in my practice:—I proscribe the use of oily substances in the therapeutics of the auditory passage, of the membrana tympani and tympanum, and replace them by one of their derivatives—glycerine, the oily nature of which affords the advantages of these bodies without any of the drawbacks just enumerated. (I make an exception in the case of those antiseptic preparations which contain, as carbolic oil, a substance absolutely deleterious to the organic germs.)

“Besides the group of which I have just written, I have noticed cases of otomycosis where no fatty substances have been employed. How are we to explain the origin of the malady under these circumstances? I conceived that there might be another source of the affection, and a most unexpected one.”

Dr Löwenberg had previously, in a communication written for the Cork meeting of the British Medical Association, drawn attention to the fact that the use of certain solutions, as those of tannic acid, sulphate of

zinc, chloride of zinc, alum, &c., appeared to induce this fungus growth. And further, that on investigating the cause of this, he found an explanation in the presence of in these various solutions cloudy collections of mycelia and spores that formed after those solutions were kept for a few days. I have examined a large number of these solutions myself, and in addition such solutions as are in common use in eye affections, and those containing the alkaloids, atropine, duboisine, pilocarpine, gelsemine. I kept these solutions in corked and open bottles. I found at intervals of from one week to a fortnight in all, whether open or closed, quantities of spores, but far more in the open bottles. The carbolised and the chloride of zinc solutions were, in some of the bottles, quite free of spores; it was not so in others.

Here also we have a fruitful source of *aspergillus*. Bottles that have been laid by for some time, perhaps not carefully corked, are used again in cases of discharge when they may be teeming with fungus spores.

Dr Löwenberg points out that these solutions must be fruitful sources of otomycosis in certain cases of perforation and catarrhal states of the meatus and middle ear. He advises as a preventative that the solutions thus employed should be filtered from time to time, and that they should at the same time be subjected to a few minutes' boiling; and that the bottle in which they are replaced should be carefully rinsed out with freshly-boiled water. He directs his patient to boil in a test-tube the quantity sufficient for each instillation. I am indebted to Dr Burnet of Philadelphia, who has written a complete description of these aural fungi for a paper in which he thus describes their appearance:—

“*Microscopic Features.*—The microscopic features of the growth of this parasite in the human ear are varied and full of interest. If a small piece of a colony of *Aspergillus nigricans*, in the earliest stages of its development, be examined under the microscope with a power varying from 250 to 300 diameters, a field similar to that in fig. 48 will be observed. It is, in fact, the first formation of rootlets or the mycelial web from which, at a later period, the fruit-stalks or fructiferous hyphens spring. It will also be seen that some of the filaments

Fig. 48.



Fig. 49.



composing the web tend to become bulbous at one end, and that the latter, as the stem grows, becomes larger and dotted (fig. 49), until finally there is standing out from the dense web of mycelial filaments a perfect fruit-stalk and a fructiferous head—the latter studded with short peg-like limbs, the sterigmata, on the free ends of which are the spores (fig. 50, B).

“All of these stages of growth I have traced in specimens of the fungus removed from the human ear. In the fluid parts of the specimen, epithelium may usually

be seen in small quantities, as the parasite develops, as in the upper part of fig. 49.

"Very rapidly, in the course of a day or two at most, the perfect fruit-stalk is formed in large numbers and in all stages of development, and the mycelial filaments can be seen to be coarser and septate. On one hand may be seen a well-formed though unripe fruit-stalk and head (fig. 50, B), while in the centre of the field there may be seen the ripe aerial fruit, from which the fully-grown spores drop literally in myriads (fig. 50, c)."

Fig. 50.



"The characteristic difference between the two varieties of aspergillus, the so-called *yellow* and *black*, is seen in the shape and size of the *receptaculum*, and the arrangement of the *sterigmata* upon it, these two parts forming the so-called 'head' or *sporangium*.

"In the *A. nigricans* (fig. 50, B) the sporangia or heads are distinguished from those of the *A. glaucus* (fig. 50, A) by the fact that in the first the sterigmata cover the receptaculum, which is spherical, on all sides, while in the latter, the lower fifth or fourth of the receptaculum, which is ovoid in shape, is entirely free from sporangia."

Dr Löwenberg, in the communication he has kindly sent to me, thus describes a new form of aspergillus, which he observed in some patients. In each there was

an "oblong and rather flat bag, completely closed on all sides; it measured from $1\frac{1}{3}$ to $1\frac{1}{2}$ centimetre in its longest diameter (corresponding to the long axis of the meatus), and about one centimetre in one of the transverse diameters, and half a centimetre in the other. All these measurements varied slightly in the different cases. One of the flat faces was obliquely truncated at the end, and showed an exact cast of the membrana tympani. The colour was yellowish white in one case, light brown in the second, and whitish grey, turning to a dirty brown, in the third. These bags were composed of mycelium, sporangia, free spores, and epidermic cellules. These were extreme, and all the other symptoms of mycosis were well marked. On examining such cases the otoscopic aspect is very puzzling, the growth entirely filling the fundus of the meatus, and hiding the membrana tympani. After removal of the bag, which was followed by great relief, the drum head was found injected, and marked with white specks on a red ground."

These curious cystic formations were also observed by Mayer, Pacini, and others. The diversity of forms of fungoid growth and their fructification is due, Dr Löwenberg thinks, to the seat of the affection and surrounding conditions, such as the quantity of organic matter present, the amount of moisture, &c.

Dr Burnett regards the *Aspergillus nigricans* as the commonest variety met with, having himself only seen one specimen of the *A. glaucus*, given him by Professor Moos of Heidelberg. He regards the relative colour of the two varieties as a most unsatisfactory diagnostic test, preferring to distinguish them according to their

size (*A. nigricans* larger, and *A. glaucus* smaller), the shape of their fruit heads, and the arrangement of the sterigmata.

Dr Charles Turnbull, who has devoted some time to this subject, is of opinion that the three varieties of aspergillus are only the same fungus in different stages of development.

Symptoms.—A patient comes to us for advice for deafness, discharge, perhaps tinnitus, which have lasted for some time, and that there is the history of an old perforation of the membrane, with recurrent attacks of ear-ache and subsequent itchiness. On examining the ear with the speculum we may perhaps find the meatus narrowed by the intermittent inflammatory attacks, and some difficulty in inspecting the drum. This difficulty is further increased by a mass which blocks up the passage and obscures the view. On examining closely we see that this is not of the nature of wax. It has a lardaceous appearance, like wet paper, of a grayish white colour; the plug is mixed with epithelium, or it appears as a round mass, and we may, on removing this with syringe or forceps, see distinctly the fungus either on the wall of the meatus, on the tympanum, in its crevices, or in the tympanic cavities if there be a perforation of the membrane. The discharge also is not of the character of ordinary catarrhal inflammation; it is thin and watery. But there is with each attack of inflammation a renewal of the pain and a change in the character of the discharge. These flakes of membrane which adhere to the meatus and membrane can be peeled off, leaving an injected surface underneath, or sometimes the pellicle removed is dotted with brown

spots of the aspergillus, or a perfect coat of the meatus may be detached.

Dr Burnett notes a fact that I have often observed, namely, that we seldom find cerumen and aspergillus. He points out that its occurrence has been noticed frequently where the patient had pursued the imprudent practice of constantly picking at the ear to keep it "clean." I have frequently seen particles of wool mingled with the fungus. A few days since I removed from the ear of a patient a mass of wool, the presence of which he was innocent of, and this had formed with fatty matter, epithelium, and fungus, a complete plug in the meatus, which concealed a large perforation. Through this I saw a flocculent mass of aspergillus growing in the tympanic cavities. I have seen this disease on several occasions in the better classes; but it is not a matter for surprise that I so frequently meet with fungus in the ear in the poverty-stricken patients, more especially the younger ones who attend in such numbers the hospital clinique. In these, neglect of the ear, want of cleanliness, general delicacy, combine to produce it.

These facts, connected with the growth of the fungus, teach some important lessons in regard to the prophylaxis of this affection, viz., the importance of perfect cleanliness in catarrhal states of the ear attended with discharge, the avoidance of fatty and oleaginous remedies in such cases, the necessity for the daily use of antiseptic and astringent lotions where we dread the formation or development of the aspergillus.

In treating the fungus I place reliance principally on alcohol and glycerine—equal parts of absolute alcohol

and glycerine. This I apply after thorough cleansing of the part, whether meatus or tympanic cavities, with cotton wool on the aural probe. I also use carbolic acid and glycerine (1 part to 2) and chromic acid. Dr Burnett speaks highly of solution of hypo-sulphite of soda (grs. iij. ad $\bar{3}$ i). The solutions which I prefer are those of sulpho-carbolate of zinc, with chloride of ammonia (gr. v. ad $\bar{3}$ i); chloride of zinc (gr. iij. ad $\bar{3}$ i), with carbolic acid. I make a rule to wash out the tympanum thoroughly in cases of perforation of the membrane with the astringent solution by passing the stream through the nose in the manner already described. Dr Laurence Turnbull speaks highly of Fowler's solution as a parasiticide, and Wreden recommends chloride of lime (gr. ij. ad $\bar{3}$ i). Whatever agent we choose, and I believe the alternate use of absolute alcohol and glycerine, and carbolic acid and glycerine, will be found the best. We must insist on seeing the patient occasionally and for some time, as by this means alone can he be certain of a permanent cure.

CHAPTER XI.

DISEASES OF THE AURICLE AND EXTERNAL MEATUS— *continued.*

Polypi.—Mucous polypi of the ordinary kind are easily recognised; in some cases they are concealed by discharge and epithelium, on the removal of which with a syringe the polypus comes into view. There is frequently a sense of pain during their formation, and the characteristic symptoms are deafness with discharge, occasionally mingled with blood. These polypi are easily removed with a small forceps, a miniature vul-cellum or snare. They may grow from any part of the meatus, or just in front of the membrane, and frequently conceal a perforation of the latter. Fibromatous polypi are not as common as the mucous.

A small fibroid polypus may grow from the membrane itself. This, however, is rare. In any case, the principal symptoms complained of are discharge, bleeding, tinnitus, and deafness. But these are often aggravated, and giddiness, megrim, and violent headache may accompany them.

Vascular Polypi.—I group under this heading those small vascular growths which are so characteristic of a type of polypus which springs rather from the membrane or the tympanic cavity. They are consequent upon the growth of granulations in the meatus, on the drum head,

or in the cavity. There is very often a perforation, though it is frequently concealed by the polypus.

For operating on these growths, I use either the rectangular ring forceps, or the lever ring forceps of Toynbee. This latter instrument is admirably adapted for this purpose. But the mere removal of these troublesome growths is only the first step in the process of cure. It requires often considerable forbearance on the part both of the patient and surgeon to follow up the treatment. Daily touching of the exposed surface with some caustic is required, as well as the thorough cleansing out of the canal; having wiped the raw surface with cotton wool, used with the aural probe, then the site of the polypus must be touched with a fine pencil of wool rolled on the point of the probe, and moistened with chloro-acetic acid. The acid is readily converted into a fluid state by the addition of a little water. I also use nitrate of silver, carbolic acid, chromic acid, and alcohol with glycerine. But after a fair trial of many agents, I prefer the chloro-acetic acid to any for this purpose. One rule should be adopted in every case; no one should be satisfied as to the cure of the disease until all discharge has ceased, any superfluous cakes of epithelium are removed, and the surface from which the polypus springs presents a healthy appearance.

In Mr Dalby's valuable *brochure* on "Aural Diseases," will be found a complete description of the microscopical appearances of aural polypi. I must refer the reader to this work for a full histological account of these growths. The usual large polypi appear to be chiefly composed of fibrous tissue with varying proportions of cell elements. In the description given by Mr Whipham, of one of the

softer varieties of polypus examined by him "of a gelatinous semi-transparent appearance and very soft," he depicts it as consisting of a fibrillated interlacing stroma, which in some cases was extremely delicate, while in others it was of a coarse texture. In the meshes were found, here and there, round cells thinly scattered; and in other parts, the branching anastomosing cells characteristic of myxoma. (Myxomatous and angiomatous polypi have been removed,—Steudner and Buck,—but they are very rare). He points out that the reticulum was finer, and the meshes smaller than in ordinary myxoma, approaching more nearly, save for the absence of lymph cells, lymphadenoma. "The tumour was bounded by a capsular layer of epithelium cells." In another specimen examined, the nature of the growth was that of round-celled sarcoma. Mr Dalby says that in his experience the lining membrane of the tympanum is "the most frequent seat from which polypi spring, next in frequency the meatus, and then the tympanic membrane." This accords with my own experience.

The neglect of polypi may lead to the most serious consequences. On two occasions I have seen death with brain complications following on aural disease that was associated with the presence of a large polypus in the meatus. In both cases there were present the symptoms of cerebral abscess. I saw the cases when the removal of the polypus was too late to avert the mischief. I refer to these cases specially in order to attract the attention of practitioners to the injurious custom of simply pulling away a polypus with a forceps or snare and then sending the patient home with the

idea that he is cured, or only giving him some simple lotion to keep the ear clean with. The polypus re-grows, perhaps the patient has the growth again torn away, or partially torn, as happens in many cases, and he now thinks it useless to apply for relief for that which is certain to return. And so he is satisfied to let things as they are until some formidable symptoms are induced by the growth and the discharge. All this is the result of want of subsequent attention to the pedicle of the polypus or the granulations that remain after its removal. If a polypus is removed, the patient should have impressed on him the necessity of a prolonged attendance or an occasional inspection of the ear subsequently, in order to ensure against its regrowth, and also to get the meatus or any other sort of the disease into a healthy condition.

Foreign Bodies in the Meatus.—From time to time, it has occurred to me to see considerable damage done by rash and persistent efforts to extract foreign bodies from the auditory canal. The late Mr Hinton has used the expression “aural surgery is simply surgical *common sense*, and needs comparatively little insistence on special points beyond that which a trained surgical *instinct* would suggest.” “Common sense” and “surgical instinct” appear alike to be blunted when, with a remarkable absence of both, persons are yet to be found who can be rash enough to employ clumsy force and ill-contrived instruments in the removal of what often is, even after a prolonged residence, a comparatively harmless tenant from the external meatus. I would say a few words for common sense and surgical instinct such as anatomical knowledge might suggest to anyone

who pauses to reflect on the form and design of the external passage of the human ear.

In the *child*, the meatus is remarkably narrow; it is mainly cartilaginous; it is often congenitally contracted; its skin-lining is directly continuous with the membrana tympani, and is intimately connected with the periosteum of the temporal bone; it is close to the dura mater, and closer still when gaps occur in the osseous canal. In the *adult*, the canal is more spiral, the osseous portion is proportionately larger; but the entire passage may be described as a coiled tube, about one inch in length, consisting of two portions, situated almost at an obtuse angle to each other, the junction of the two being marked by a peculiar contraction, any further closure of which, in consequence of inflammation or thickening, completely shuts off the bony internal pouch from the external funnel.

Two things are at once evident from these simple considerations of the anatomy of the passage; first, that the direction of any extracting or expelling force must depend on the portion of the canal in which it is applied; secondly, that, having in view secondary consequences, and also the effect that inflammation has in frustrating our effort to remove a foreign body from the passage, we should employ no force that is in the least calculated to excite this inflammation. The greater the swelling of the epidermis with subcutaneous cellular effusion, and it may be periostitis, the greater the jamming the foreign body, whatever it is, gets. If it be hard and angular, this is more likely to occur than if it be smooth and round. If it be pushed into the pouch in front of the membrane, and the latter be con-

tused in attempts to catch it, the more likely are we to have inflammation of the membrane and resulting perforation, with tympanic mischief. If the canal becomes so swollen that the foreign body cannot be seen, and its removal be still attempted, then the effects of this "groping in the dark" are more disastrous; further inflammatory mischief and tighter jamming.

Now, what is it that, in the large proportion of cases, fixes foreign bodies in the ear?—Attempts at removal. If the body do not occupy the calibre of the canal, it lies in it, and there is a space for the expelling force to be directed from behind on to it. If it be so large as to fill the entire calibre of the passage, which is rarely the case, it will, previously to being interfered with, in all probability lie loosely in the passage, its further entrance being arrested by the contraction of the wall. In my experience, the most frequent seat of the arrest of a foreign body is at the junction of the cartilaginous and osseous portions of the meatus. It becomes *arrested* here, or is driven beyond against the membrane by extractive efforts. Every touch of an instrument, no matter how gentle, sends it further in: each forcible effort tends to further *impaction*. Of course, there are some bodies so small and so shaped that it is a matter of no difficulty to catch them with a forceps and withdraw them. But I think it may be laid down as an axiom in aural surgery that, in the case of any arrested body in the meatus, where any space exists between the foreign substance and the wall of the meatus, the only agent which should be employed is water. I have read a great many pages devoted to the consideration of the subject; I have heard a good many opinions as to the

superiority of this or that method of removal; my belief is, from several years' experience, that syringing is *the* one safe and certain method of removing foreign bodies from the ear. This is *the rule*; there may be some few and rare exceptions. I have, by careful, repeated, well-directed syringing, removed foreign bodies of all descriptions and shapes from the meatus by syringing alone. Only on a few occasions have I ever succeeded in removing a foreign body after failure by syringing, and I feel confident that, had I the opportunity of giving to the syringe a fair trial, I would have found it equally successful. Let me enumerate some of the substances I have thus removed: glass beads of all shapes, shells, stones, pieces of chalk, berries, ears of corn, pieces of slate pencil, &c. I could fill pages with the history of cases of foreign bodies in which by syringing alone I have got rid of the troublesome inmate of the meatus. If the body be impacted, or if it completely occlude the canal, much will depend on the nature of the body, its shape, the material of which it is composed, the length of time it is lodged, the presence or absence of inflammation, the kind of instrument at hand. It is my conviction that, in all recent cases, those quickly brought to the surgeon, syringing is the best means to adopt; in all cases where inflammation is not present, no matter how long the body lies lodged, syringing is also the best means; and, in cases where inflammation is present, I prefer, as a rule, to wait, using means to subdue it, with gently syringing daily; and, if patience only be exercised, success in the end is almost certain. I prefer to make no remark here as to instruments. The instrument suited for one occupant

of the canal will be found valueless for another. The shape and the position of the foreign body are the two things which must be considered in the employment of any instrument. To avoid all force is the rule, never to be violated, let the circumstances of the case be ever so tempting.

I now desire to quote the following few cases out of many constantly occurring to me in hospital and private practice, which bear on the foregoing remarks:—

Some years since a child was brought to me with a shell in the meatus, where it was quite visible. It was one of those small yellow shells common on the beach. The convex surface was directed outwards. It completely filled the meatus, and was jammed in the contracted portion. Many attempts had been made to remove it, but all resulted in driving it further in, and its smooth surface rendered it impossible to catch it. I advised patience and syringing. There were both pain and inflammation when I saw the ear. Some catarrhal discharge subsequently formed. The ear was syringed daily. In about three weeks from the time I saw the case, the unwelcome guest suddenly came out while the ear was being syringed.

A gentleman was tickling his ear with a programme-pencil while at a ball. In doing so, the bone top of the pencil remained in the ear. He fancied that he afterwards heard it fall out. Feeling, however, uncomfortable the next day, he sought advice, and the practitioner whom he consulted thought he saw the white flat surface of the bone-cap. Several efforts to seize it were made, giving him great pain. On the following day, these were repeated. The passage now

became swollen and painful, and another surgeon was consulted, who, without expressing any opinion as to the presence or absence of the foreign body, wisely abstained from all interference, and directed simple washing out of the ear, and leeches to subdue the inflammation. After some days I saw the patient. I found the passage contracted by the inflammation, so much so that no speculum could be inserted; there was considerable pain and complete deafness. However, with the otoscope and Politzer's bag, I satisfied myself that the probability was against the presence of a foreign body; but there was evidently a considerable perforation of the membrane. With care and treatment, he ultimately recovered, hearing the watch before he left me at twelve inches; but there has remained a permanent perforation in the membrane. This case was all the more serious, as the hearing in the other ear was impaired from childhood.

Some months since, a child was sent to me from the country by two medical gentlemen, with a glass bead in the ear. The bead was blue, diamond-shaped, and was taken from one of those "surprise packages" of sweets which are sold to children. The bead was in for several days, and resisted all attempts at extraction and syringing. The child was very restless, so I put her under the influence of chloroform, and tried syringing, but in vain. The smooth, diamond-cut, conical end of the bead was turned out, and it was fixed in the passage. Keeping the child well under chloroform, with assistance, I passed the sharp curved edge of a Critchett's cataract-scoop over the margin of the bead, between it and the wall of the meatus; I then was

able to slightly turn it on its own axis. This gave me room to pass a loop of silver wire over the margin of the bead (as originally recommended by Mr Hutchinson) and obtain a grip of it. But after two or three efforts, the wire broke each time, and there was not room to pass a stronger wire behind the body. I, however, succeeded in getting a double loop of the thin wire over the edge, and finally brought it away. Some years since, a child was sent to me with a spherical glass bead in the meatus, which completely filled the calibre of the canal. I thought that forcible syringing might, in this instance, by driving the body further in, do more harm than good; and, as the bead appeared not to be firmly impacted, and was not long in the passage, I thought of Brunel's plan for the coin in his larynx. Accordingly, I turned the child on her side, with the affected ear down, and, with assistance, while in this position, I placed the fleshy part of the thumb of my right hand (the body was in the left ear) over the opposite ear, the fingers being extended on the head, the inner side of the palm of the hand thus came above the auricle, on the temporal and parietal bones; by giving a few sudden jerks to the head in this position with the inner side of the hand, the bead dropped out.

A child was brought to me with a piece of chalk which she had wedged into the passage. Efforts had been made to extract it. The chalk had been partly broken down with the forceps, and there was no space available to pass any instrument behind the mass. I scraped away with a sharp scoop as much as possible of the chalk from the upper wall of the meatus, washing the débris away with a syringe. I then persevered in

properly directed syringing, and the mass came away under chloroform.

Lately, I had a very obstinate case. A child with a smooth stone, rather angular in shape, was brought to the hospital; the stone was inside the contracted portion of the canal. I tried syringing without avail. The stone, though it was not possible to get any extracting instrument between it and the wall of the meatus, was movable. I determined to wait and syringe. The child was troublesome. Several times I got him under chloroform, and examined the stone with a fine probe and good light carefully. I tried to catch it with cobbler's wax, but it would not come. I made an effort to fit the spoon behind it, but failed. It only went further in. Some inflammation setting in in the meatus, and discharge appearing, I desisted from all efforts, and merely had the ear washed out with warm water daily, filling the meatus each time with glycerine. By degrees the stone worked its way out, until it was about halfway through the narrow part of canal. I was now tempted to try and get a wire behind it; it only pushed the stone back. I, therefore, determined to do nothing but syringe. Some discharge continued. At the end of three weeks the stone came away. There was slight catarrh of the passage, but the membrane was not affected, and the child recovered with perfect hearing.

Having thus given the brief details of a few obstinate and difficult cases, I desire to quote these remarks of Hinton and Tröltsch on this subject. The former says:—"I must be pardoned for speaking earnestly on this point. Even to this day it remains

the fact that ears are thus destroyed without shadow of reason or excuse, and not by careless or incompetent persons alone. I believe it may be laid down as a rule that, whenever an instrument will succeed, syringing would also succeed; and that, when proper syringing will not succeed, all instruments are full of danger; if had recourse to before violence has been used, would probably, in all cases, remove the offending body in ample time to prevent mischief." "Injuries," says Tröltsch, "are frequently inflicted on the soft parts of the meatus by patients with itching in the ear by means of knitting-needles or sharp metal ear-picks; graver and more serious frequently prove those contused and lacerated wounds of the meatus inflicted by a professional hand, in attempting the removal of foreign bodies, even in those cases in which most harmless intruders, as morsels of bread and paper, are concerned. On such occasions, the instrumental foreign bodies are generally the chief part of the evil."

There can be no doubt that foreign bodies may remain a long time in the meatus, and produce no bad results. We should remember this fact in cases where patience is indicated, and where there is no need for active and it may be dangerous interference.

Finally, on this much debated question of the extraction of foreign bodies from the ear, I venture to give it as my opinion that *all* instruments are in a degree dangerous, to be employed with caution, and on no account should their use be continued until proper syringing has first been given a long trial. To syringe the ear, the lobe should be held well back, the head sideways, the face slightly up, and the stream directed

with sufficient force so as to pass between the foreign body and the wall of the meatus. I fill the ear with glycerine after each syringing, and repeat the process daily. I have known a piece of cobbler's wax used with success to draw a foreign body out. Glue applied with a camel's hair pencil (Löwenberg) and allowed to harden on the body has been employed. Dentist's cement may be applied with the same object. Quietness and firmness with friends, patience in using the syringe, extreme caution with all forms of mechanical helps are the essentials for dealing successfully with foreign bodies in the ear.

Warts.—Troublesome warts occasionally grow on the auricle; these are best dealt with by ligature, and their growth prevented by acid nitrate of mercury applied cautiously to the wart when the ligature separates. I lately removed a very large arterial wart fed directly by a large vessel, but in consequence of too early separation with the ligature, some severe hæmorrhage occurred, which was easily restrained by a compress. In a case of epithelioma of the auricle in the person of an otherwise healthy farmer, I proposed removal of the part affected, the patient refused, and I am aware that, up to the time of his death, which occurred from another cause shortly after, the disease increased and involved the entire helix. But epithelioma having its origin in the auricle is comparatively rare, and the prudent treatment, if the disease be seen early, is the knife. A few cases I have treated most successfully by shaving off the growth and then applying caustic potash paste and chloride of zinc. An example of schirrus I have never seen.

Eczema.—We are constantly consulted for eczematous states of the auricle. In practice these may be divided under two heads. There is the simple eczematous eruption which is thrown out in children, especially in connection with the exanthemata and whooping cough, and which, in strumous subjects so frequently attends various catarrhal states of the meatus and tympanum. A child with phlyctens on the conjunctiva, or some form of catarrhal affection of the eye, comes with an eczematous state of the ear and face or head. The child is characteristic of its class; there is a general anæmic and debilitated appearance, with the peevishness and irritability of temper which are usually present; parents try to sooth with sweets, cakes, and all sorts of trash; the result is, that at hospital we generally see children of this type of constitution with the accompaniment of sweets, cakes, or fruit. Defects in hygiene, and all the attendant evils help out these eczematous states. This form of eczema differs in no way from the similar disease which attacks other parts of the body. It is easily recognised by the discharge and the crust which forms. The cleft between the auricle and the mastoid process is often the seat of an irritating discharge, the surrounding skin is excoriated, and with difficulty can we examine the raw mucous surfaces. The disease may attack the meatus—the auditory canal is filled with a collection of epidermic scabs, muco-purulent discharge, the glands about the mastoid process in the neck are enlarged.

In nearly all these cases there is some constitutional cause for this local affection that should be looked to. In children it may be disordered digestion, worms, dirt,

or general impoverishment of the blood in a leukæmic temperament. Softening and separating the crusts, first by oil packing at night (a few pieces of soft linen rag soaked in oil, and covered with oiled silk or gutta-percha tissue), and after a few days treating the exposed surface with some mild stimulating astringent ointment, such as benzoate of zinc with carbolic oil and vaseline, or liq. carbonis detergens and liq. plumbi diacet. and vaseline, or a little of the ordinary calomel wash; and if there be much discharge, particularly if the skin between the attachment of the auricle and the mastoid be raw and moist, the use of Wilson's lotion of calamine and oxide of zinc in rose water, applied during the day, the powder being allowed temporarily to dry on the part, will be found a sufficient process. At the same time the internal administration of mild alteratives, with such tonics as cod-liver oil and iron, or mineral acids, is indicated. The internal administration of a few drops of liq. arsenicalis with the meals has often the best effects. But the essential element in the treatment consists in the attention paid to the diet and general surroundings of the patient. Simple and plain food, plenty of milk, and a little oatmeal in the mornings, with the avoidance of all trashy stuffs, attention to the cleanliness of the child's person, with sufficient out-door exercise, should be the directions to parents.

But by far the most troublesome variety of ulceration of the auricle is that which results from a chronic form of eczema,* in which a thick and hard scab forms over a most inveterate and highly ichorous discharge.

* In the "Atlas" I have applied the term "inveterate" to this affection.

This crust clings with great tenacity to the part, and is with difficulty removed. When it is removed, the fluid which lies concealed by the scab is nearly transparent and straw-coloured. The entire helix is involved, and the ulceration extends so deeply that there is a loss of substance, and perhaps permanent disfiguration of the lobe. I have had recently three such cases under my care. In one there remains considerable deformity, from a long-continued and oft-recurring attack of the kind above described. Two cases of this nature are shown in the "Atlas." The auricle is marked with permanent scars, or, as in the cases represented in the "Atlas," is destroyed in parts completely eaten away as if by a lupoid sore. Various remedies had been used, but with no ultimate benefit. I was consulted when the deformity was considerable. The treatment I have pursued in these cases is much as follows:—Complete removal of the scab, and thorough cleansing of the raw surface, which is then touched with either chromic acid or carbolic acid lightly. This removal of the scab is repeated as it forms, and the acid is very gently re-applied. The patient may himself use a lotion of calomel and lime water after a few days, and smear a carbolised zinc and vaseline ointment to the part at night. A few applications of the acid are generally sufficient, and then the chloride of zinc (gr. xxx ad ʒ i), applied after the removal of the scab, acts admirably. The main secret is the removal of the crust and the thorough, daily, topical application to the ulcerated surface beneath.

The general health, at the same time, has to be attended to, and the internal use of arsenic and iodide of

potassium may with benefit be prescribed. Often in these eczematous scabs and in psoriasis of the scalp, the meatus becomes full of cakes of loose epithelium, which block up the passage, impair the hearing, and produce in time alterations in the membrane. These should be constantly and carefully removed by syringing and forceps; the passage well cleaned out with cotton wool, and chloride of zinc with glycerine, or glycerine and rectified spirit, and nitrate of silver solution employed to keep the auricle healthy. Of late I have used the chaulmoogra oil, combined with almond oil, in a pack, or applied it combined with vaseline and oleate of zinc with marked benefit in many cases of eczema, in the latter stages of the disease.

CHAPTER XII.

DISEASES OF THE AURICLE AND EXTERNAL MEATUS— *continued.*

Othæmatoma, or Sanguineous Tumour of the Auricle.

—Othæmatoma, or sanguineous tumour of the external ear, is, with very rare exceptions, solely met with amongst those affected with cerebro-mental disease, and has hence been termed “the insane ear.”

Nature and Appearance.—Othæmatoma consists of an effusion of blood from the perichondrium investing the cartilage of the auricle, appearing as a tense and shining tumour of a reddish blue or livid colour, varying in size, and occupying some portion of the concavity of the organ, rarely forming on the posterior convex surface. One such case has, however, come under my observation; here, however, the tumour was not confined to this region. When it commences in the concha, the tumour is generally localised above, and externally by the ridge of the antihelix, and extends inwards towards the meatus externus, which it may occlude, causing deafness according to the degree of occlusion. In this situation the tumour presents itself as a smooth, and usually even swelling, about as large as a pigeon's egg; when the fossa of the helix is the site of the effusion, it is confined below by the ridge of the antihelix, and the swelling then assumes a somewhat kidney-

shaped outline. In exceptional cases the tumour becomes extended over the entire surface of the auricle, and when this is the case, the various ridges and cavities become wholly obliterated, the hollow of the ear being filled by an egg-shaped swelling, fuller above, and losing itself inferiorly in the lobule, which is never implicated.

Two such cases are at present under my observation. In one, a female suffering from active melancholia, a hæmatoma appeared in the left ear, May 30, 1877, and in *three* days it had developed to a large globular tumour, filling the entire cavity, of a livid red colour, and completely obliterating the meatus. In two months it had commenced to shrink, and now, after six months, the ear is quite shapeless and shrivelled. The second instance occurred in a male patient suffering from subacute mania, the entire cavity of the auricle becoming occupied by a large ovoid sanguineous swelling, without any known cause, in less than twenty-four hours. The ear in this case is now also shrunken, the upper part of the concha being thrown into several sinuous folds, the organ still, however, retaining its normal shape and gross outline. Othæmatomata are accompanied by scarcely any subjective symptoms, but little pain or increased heat being experienced, and any deafness that may exist being due to the mechanical closure of the external meatus by the tumour. They frequently form very rapidly, instances of which I have just mentioned, but usually from a fortnight to three weeks elapse before they become fully developed. The contents are usually found to be purely sanguineous, though a yellowish serous fluid has been observed to escape on puncture; the contained blood remains fluid for a longer period

than when extravasated elsewhere, but when evacuated shows a tendency towards normal coagulability. Suppuration sometimes occurs in the contents of the tumour, accompanied then with the usual symptoms of heat, pain, &c., followed perhaps by rupture of the sac, if the latter be not surgically interfered with. In one such case lately under observation free incision afforded vent to a large quantity of sero-purulent fluid, but the tumour rapidly filled again, death taking place before further interference could be had recourse to, the case being one of far advanced paralytic dementia.

The course of othæmatomata in many respects closely resembles that of blood extravasations occurring in other parts of the body. The tumour, in its ordinary condition, rarely bursts, though the skin may crack, and some sanguineous oozing follow, usually at about the end of three weeks, or from that to a month, when the tumour has become fully developed, the effused blood slowly coagulates, and gradually solidifies, and then what may be termed the secondary stage, or that of *shrivelling*, commences. As the watery portion of the blood is re-absorbed, and the fibrin precipitated, the skin and cartilage become irregularly adherent to the cyst walls, and the latter contract unequally upon themselves; new fibrous tissue is then formed, which in time may become cartilaginous, or even osseous; and as the result of these changes, the affected surface of the auricle is distorted, and assumes the most bizarre and fantastic forms, which are henceforth permanent. The hollow of the ear may be thrown into irregular folds or sinuities; the helix folded over the concha, which may be greatly thickened, and frequently the entire organ

becomes so crumpled and shapeless as to be barely recognisable. I have in my possession the ears from the body of a man who had had blood tumours very many years previously, and here the different portions of the organs have become so incorporated with each other, that their normal configuration is almost entirely obliterated.

Regarding the frequency with which either ear is affected, observers state that in three cases out of four the left is either solely, or, in cases where the effusion is bilateral, primarily attacked. In the majority of cases I have met with, the affection has been bilateral, but in those unilaterally attacked the left side has the preponderance.

Ætiology and Pathology.—The occurrence of othæmatoma was first noticed in Germany, but as an accompaniment of mental disturbance it was first studied in France by Ferrus in 1838. The result of his researches directed attention to the subject, and many important papers relating to it subsequently appeared from time to time, the most important being the "Memoirs of M. Achille Foville," published in 1859, and those of MM. Delassiauve and Motet, inserted in the "Gazette Hebdomadaire" in the same year. In the year 1850, Franz Fischer directed attention to two forms of affection occurring in the ears of the insane, the one appeared as a "serous œdema," the other as a "sanguineous tumour." The first condition was frequently bilateral, colourless and painless, rapidly forming, and as rapidly disappearing. The second was unilateral of a special colour, painful, and of longer duration, the contents being easily reproduced after an accidental puncture, and

subsequent deformity of the ear ensue. Following these authors, M. Maury published a thesis on the subject, in which he gave a resumé of the various views which had been advanced as to the nature and origin of the tumours up to that time.

As to the ætiology of the affection, various theories have been put forward from time to time to account for their peculiar occurrence. Yung and Senbuscher attributed them to passive hyperæmia of the neck and ear, with paralysis of the vascular nerves. According to Neumann the hæmatoma is an erysipelas of a particular kind. Schmaltz considers the affection to be the result of inflammation of the cartilage of the ear, and Fischer coincides in this view, attributing it to a chronic inflammation of the auricular cartilage and its envelope, to which is added a dyscrasia of a particular kind. The sanguineous tumours are looked upon by Renaudin as a serous cedema, a passive hæmorrhage, an active effusion, or the product of inflammatory action, according to the state of the affected individual, the nature of the malady, and the conditions which have preceded their appearance. "They are produced," says Dr Merlan, "most frequently in a spontaneous manner. Sometimes under the influence of atmospheric variations, and sometimes as the result of traumatic causes." Marcé, who has published a case of double hæmatoma of the ear, in which the eyelids were also the seat of sanguineous effusion, believes that, under the influence of congestion, the vessels of the ear dilate, and that this condition determines or favours the production of hæmatoma. M. Delassiauve, sharing the views of Renaudin, is of opinion that the hæmatoma must be in great part

attributed to the textural peculiarity and special sensibility of the ear. Its proneness to become flushed under the least emotional disturbances, or under the least physical injury, and its sudden pallor under other circumstances, combine to prove, says this author, that the ear participates more than one imagines in the conditions of general life. M. Foville, in the conclusions arrived at in the Memoir already alluded to, thus expresses himself: "The formation of sanguineous tumours of the auricle is most often preceded, and accompanied by a general disturbance of the cephalic circulation." Morel is also in favour of the theory of congestion with hæmorrhage. M. Ducros, in a Memoir presented to the Faculty of Medicine at Montpellier, concludes "that the causes of hæmatoma are multiple, but that traumaticisms alone never suffice to explain its occurrence; it appears that a local affection of the cartilage, depending on a disturbance of the nervous system, always pre-exists." M. Castelain, who has examined the question closely, thus expresses himself:—"Under the influence of this profound disturbance of the economy, there occurs a *ramolissement* which plays a considerable part as a predisposing cause in the production of sanguineous tumours." M. Bonnet is of opinion that the sanguineous tumours of the ears are veritable congestive apoplexies due to degeneration of the sympathetic, which results in turgescence of the vessels of the ear, and, as a result, the apoplexy is produced. Griesinger leant to the hypothesis that traumatic causes were the most fruitful source of their origin, alleging that the tumours were not met with in asylums carefully looked after and in which the attend-

ants were active in their surveillance. In this country Dr Wilks is of the same opinion, considering the tumours to be the result of violence inflicted either by the patient himself or by others, the constitution being predisposed to sanguineous effusions. This view is, however, negatived by the experience derived from the modern treatment of the insane, which is now free from any such violence, and yet the occurrence of hæmatoma is no less frequent at the present time than formerly before the humane system was introduced. Moreover, if injury were the cause, we should expect to find ecchymosis or abrasion of the skin with damage to the auditory apparatus, which, so far as I am aware, never appears; and again, on the opposite hand, as Mr Lennox Browne remarks ("West Riding Asylum Reports," vol. v.), how many blows are being inflicted on the ears of those not insane, and yet true hæmatoma is rarely, if ever, developed as the result.

Dr Nicol has suggested that the sanguineous effusion is produced by the pressure of the delicate structure of the external ear against the mastoid process of the temporal bone during sleep, by the pillow beneath—especially when the latter is hard—in a patient weakened by some "blood dyscrasia." Were this the cause, many more cases of othæmatoma must occur, as the great majority of patients who are likely to be its subjects lie on one or the other side, bear the same pressure, and suffer from the same blood dyscrasia, and yet hæmatoma occurs in but a small minority. Moreover, as Dr Lennox Browne goes on to say ("West Riding Asylum Reports," vol. v.), "there is no reason to suppose that the pinna is delicate and peculiar in structure,

but on the contrary, its tissue is that best adapted, by elasticity and firmness, not only to resist violence, but also mould itself to receive pressure." Dr Robertson thinks that othæmatoma is most probably due to functional disorder of the cervical sympathetic, associated with, or perhaps resulting from, the existing cerebral or cerebro-spinal disturbance. He grounds this opinion on the following data:—(1.) The tumour not unfrequently appears on both ears simultaneously, without any indication of either being injured. (2.) An effusion under the conjunctiva occurred in a case of dementia at the same time, and on the same side as the tumour of the ear. (3.) Some of its complications, such as Graves' disease, indicate disorder of the vaso-motor system. Whether such vaso-motor disturbance is the cause or not, there can be no doubt that mental excitement, resulting from derangement of the vascular system, is a very constant factor, its occurrence being most frequent in those forms of insanity (*vide* appended tables) in which such excitement runs high.

The morbid appearances presented by the shrivelled ear differ according to the age of the formation. Dr Barlow, as mentioned by Dr Alexander Robertson ("Glasgow Medical Journal," July 1875), states that at the end of two months he has found a section to be dark and fleshy in aspect, firm and slightly elastic in structure, and adhering closely to the cartilage of the auricle, and less firmly, though with considerable tenacity, to the perichondrium. The tumour was one-fourth of an inch in its thickest part; a transverse section, under a power of 300 diameters, showed it to be composed almost entirely of white fibrous tissue,

with here and there collections of shrivelled blood corpuscles—the fibres being stained at these points with blood pigment. The fibrous tissue was denser at the point of junction of the cartilage with the tumour than at any other point. One of the shrivelled ears I last mentioned, which I have examined, measured on section $1\frac{1}{8}$ in. in greatest thickness, and was dense and solid throughout. A fine section under the microscope showed it to consist of somewhat loose fibrous tissue with deposits of fine hyalin cartilage, and a little within the centre a triangular-shaped mass of bone containing wide channels with lacunæ and canaliculi. The condition of the ears here, as I have mentioned, was of very long standing, and between this and the organised clot of the earlier stages I noticed fibrous tissue and cartilage in varying degrees of development.

Forms of Mental Disorder in which Othæmatoma occurs.—Othæmatoma is not confined to any one form of insanity; it has been found in mania, melancholia, and dementia, but it occurs most frequently in general paresis, and insanity associated with epilepsy. The two following tables give the form of mental derangement, and the relative frequency with which one or both ears were affected in fifteen cases which have come under my observation.

Of these fifteen cases, eight males were the subjects of either acute, subacute, or relapsing mania, with greater or less excitement. Of these four have recovered from their mental derangement, two died from maniacal exhaustion, while the remaining two are still under treatment in the asylum. One of these has considerably improved, and there is a prospect of his ultimate recovery ;

TABLE I.—*Males.*

Name.	One or both Ears.	Form of Mental Derangement.	Result.
H. D.	Both.	Acute Mania.	Died.
D. R.	Right.	Subacute Mania.	Recovered and discharged.
C. H.	Both.	Relapsing Mania.	
J. M.	Both.	Chronic Dementia.	Died " at an advanced " age.
P. L.	Right.	Acute Mania.	Recovered and discharged.
E. M.	Both.	Imbecile.	In Asylum still.
J. H.	Both.	Acute Mania.	Died.
J. R.	Left.	Subacute Mania.	Recovered and discharged.
J. M.	Left.	Acute Mania.	In Asylum still.
D. S.	Both.	Subacute Mania.	" "

TABLE II.—*Females.*

Name.	One or both Ears.	Form of Mental Derangement.	Result.
H. M'C.	Both.	Acute Melancholia.	Recovered and discharged.
E. D.	Both.	Epileptic Dementia.	In Asylum still.
B. C.	Left.	Epileptic Idiocy.	Died.
M. H.	Left.	Dementia.	In Asylum still.
E. H.	Left.	Active Melancholia.	" "

in the other the tumours aborted before arriving at perfect development. Of the remaining seven, three suffered from chronic weak-mindedness, two males and one female; two females from mental disorder complicated with epilepsy; and two females from the more acute forms of melancholia with considerable excitement. Of the fifteen cases, in eight, six males and two females, both ears were affected; while out of the remaining seven, the left was alone affected in five, three females and two males, the

right, in two males, showing a preponderance of the former over the latter. As regards the influence of othæmatoma in the prognosis of mental derangement, it has hitherto been almost universally stated that it is unfavourable in the highest degree. Dr Savage, of the Bethlem Royal Hospital, says, that in that institution he has never seen a case in which it occurred recover. I am inclined to think, however, that its importance in this respect has been too highly estimated. Referring again to the cases above tabulated, it will be seen that five out of the fifteen have been discharged recovered, and there is a prospect of the recovery of a sixth; hence, though an unfavourable prognostic, the development of a hæmatoma should not, I think, be looked upon as one of the physical characteristics of a hopeless lunatic.

Treatment.—Gruber, in an article on othæmatoma in his “Handbook of Ear Diseases,” suggests surgical treatment, and recommends evacuation of the contents of the tumour and subsequent compression; the difficulty, however, of dealing with the class of patients in which such tumours occur, must in the great majority of cases prevent any such interference; it is to be feared also that such pressure as could be applied to the ear would be powerless to prevent the refilling of the tumour, the contents of which might then, from the admission of air, undergo suppuration, and greater mischief follow than if the tumour had not originally been interfered with. In some few cases indeed, where, on other grounds, a hope of final recovery from the mental disorder exists, and when it may be important to prevent the possibility of the after deformity which will in all probability result if the swelling be allowed to run its course undisturbed,

the aspiration of the sanguineous effusion may perhaps be attempted, and an endeavour be then made to induce rapid and equal adhesion between the cyst walls. Painting the surface of the tumour with vesicating fluid has been also suggested, and I believe tried successfully in several cases, though as far as I am aware it has not come into extended use.

The following conclusions Dr Lennox Browne, in the paper already mentioned, considers to have been fairly established as the result of much independent investigation:—

1. That prior to the occurrence of an othæmatoma the tissues of the auricle undergo a softening process (Virchow) or chondromatic change (L. Meyer). These changes are synonymous with the “vegetative disturbance” (blood dyscrasia) of Fischu and Nicol. No evidence has been adduced of the pre-existence of atheromatous disease of the vessels, as is believed by Gruber and others.

2. That the general nutritive derangement to which all othæmatomatous patients are subject, and the conspicuous absence of these tumours in the persons of patients suffering from monomania, a mental disease which only involves a portion of the cerebral machinery—or in which, as in melancholia, the lesion is of the most airy material nature (Nicol), induce a belief that the aural tumour is in a large measure the result of a general, and not of a purely local condition.

3. That intense general excitement is an important and almost universal factor in the causation of these tumours, leading as it does to considerable vaso-motor disturbance, and that the intimate connection of the cervical and intracranial ganglia with the vessels of the

auricle strongly predisposes to vascular extravasation in their neighbourhood.

4. That the vascular distribution of the part receiving as it does branches from the terminal arteries of the external carotid, all freely communicating with each other, and anastomosing with vessels supplying the brain structure itself, is sufficient to account for the preference of the auricle as the point of effusion. The helix being the thinnest portion, is that part which is first attacked.

Lastly, That the left ear is most frequently affected, or when the hæmatoma is bilateral, is the first in which a tumour is developed; my own explanation (Dr L. Browne's) of this fact is the nearer position of the left common carotid to the heart, and the more direct, and less impeded arterial supply to the left, than to the right side of the head. It may just be noted that arachnoid cysts, so frequent in that form of mental disease in which othæmatomata may be expected are more commonly found on the left than on the right hemisphere of the brain.

CHAPTER XIII.

ADENOID GROWTHS IN THE NASO-PHARYNX; INFLUENCE ON HEARING.

We frequently meet with adenoid tumours in childhood and youth, causing a train of symptoms which soon attracts the attention of the patient or of the parents.

[In his brochure on adenoid tumours, from which this translation* is taken, Dr Löwenberg, who first proved (1865) the direct relation of adenoid tumours of the naso-pharynx to the well-known granulations on the posterior wall of the throat (follicular pharyngitis—Virchow), fully enters into the etiology and symptomatology of this affection.† Dr Meyer of Copenhagen had also drawn special attention to these growths ("Archives of Othology," 1873-74). So had Czermak, Türck, and Semeleder. Further light was thrown on their histology by the researches of MM. Cornill and Ranvier, who accurately described the structure of the tumours. The large bed of adenoid tissue extending from the fossa of Rossenmüller and the Eustachian tube at either side forming the pharyngeal tonsil, a kind of (Lacauchie) "secreting sponge," is the frequent seat of these adenoid collections. They are "covered

* "Archives D'Otology," vol. xi.

† *Medical Press and Circular*, April-June 1879, Dr Löwenberg on "Adenoid Tumours of the Naso-pharynx, their influence on Hearing, Respiration, and Phonation." Translation by the Author.

with epithelium, of which the superficial cellules are cylindrical and generally vibratile; the substance is composed of adenoid tissue, of which the trabecules only become visible after we have removed with the forceps the numerous lymphatic cellules which fill the network." Dr Löwenberg believes that the difference between adenoid growths and the granulations so frequently met with in the pharynx lower down than the level of the soft palate consists in this, that the former involve the entire group of elements of the mucous membrane of the naso-pharynx, whereas it is simply the follicles that are hypertrophied in the latter (follicular pharyngitis). There is a strict histological similarity, however, between the two, the difference depending rather on the anatomical site of the adenoid formations.

In the etiology of adenoid growths, it would appear that heredity plays an important part, an entire family being at times affected, and the characteristic symptoms, with the accompanying physical characteristics, being found in the parents. As we might expect from the presence of growths that obstruct the nasal cavities and the Eustachian tubes, we have characteristic symptoms dependant for their presence on the interference with the functions both of respiration and bearing. Naso-pharyngeal catarrh, nasal speech, interference with nasal respiration, breathing with the mouth open, snoring at night, alteration in the form of the chest-wall from the continuance of the abnormal respiration, and thus the child acquires a peculiar physiognomy, and perhaps gait. The occlusion of the nasal cavities, and consequent interruption with their function, produces in time serious changes in the pituitary membrane

which becomes thickened or dropsical (Störk), the sense of smell is blunted or obliterated, and to a degree that of taste; the nose ceases to act as our natural respirator and air filterer, the air reaches the lung more directly impregnated with impure matters, and colder.

Perhaps there is no more distressing symptom in young children than the interference with normal respiration during sleep, and the consequent loud snoring with restlessness. Dr Löwenberg thus accounts for the peculiar prominence of the crondrosternal cartilage to be found in some patients suffering from adenoid tumours. They occur during a period of obstructed nasal respiration in childhood. "A time must of necessity arise when the obstruction of the posterior nares, which is habitually incomplete, becomes still more impeded during certain attacks of greater swelling, or of more copious secretion, which are peculiar to the affection. At those times nasal respiration is insufficient, but, as the patient has not yet exclusively breathed by the mouth, from time to time he involuntarily closes it, and attempts to breath by the nose, this latter being closed, the thoracic cavity cannot be enlarged. In consequence of this there is lowering of the diaphragm and contraction of the intercostal muscles, particularly the external, which tend to enlarge the thorax during the air passage through the glottis; for the same reason there is also flattening of it. This flattening proceeds from the predominance of the atmospheric pressure on the one hand, and on the other the elasticity of the pulmonary tissue, which tends to diminish the volume of the lung in proportion as the intrapulmonary pressure diminishes." Thus the intercostal spaces are deep-

ened and the cartilages are deformed. Dr Löwenberg enters at length into the influence that these growths exercise on the pronunciation. To the peculiar defect in speech he applies the French term "*nassonnement*." The letters *m* and *n* are converted respectively into *b* and *d*. There is in addition an absence of resonance in the vocal sounds. This is the direct consequence of nasal obstruction at the *posterior* nasal apertures. It is especially perceptible in the pronunciation of the German nasal sounds. This is not to be confounded with "nasal twang," or the sound conveyed when a person speaks too much through the nose—nasal speech increased,—on the contrary, "*nassonnement*" expresses speech in which there is no nasal resonance.

Now that we are so familiar with the effects of adenoid enlargement on the hearing, it is not necessary to dwell for any length on the influence the adenoid encroachment must exert, through swollen or closed Eustachian tubes, on the middle ear, producing chronic catarrh, with accompanying tinnitus, deafness, perhaps perforation, and suppurative discharge. I have chosen in this work to give in Dr Löwenberg's own words his description of the diagnosis and treatment of adenoid tumours. I can endorse from my own experience nearly all that he says on the subject, and bear testimony to the practical gain to be derived from a careful perusal of his description of the disease, and his method of treatment.]

The physician who is consulted in cases of this nature makes a grave mistake if he ignores the existence of this disease, and attributes the cause of the accompanying symptoms to other affections, with which he is familiar, especially to simple chronic coryza, or to

hypertrophy of the tonsils (it is far less frequently mistaken for nasal, or naso-pharyngeal polypus). Coryza, and hypertrophy of the tonsils, are usually considered of but slight importance, and parents are deluded by the hope that all will be set right at the age of puberty, a period which is popularly supposed to exert a powerful influence, not alone on these affections, but also on diseases of the ear.

Unfortunately, none of these are cured spontaneously, and the injurious effects of this therapeutical negligence soon become apparent, in the expression of stupidity, the pronunciation, and other consequences of the morbid growths.

The four affections that may be confounded with adenoid growths are—chronic coryza; hypertrophy of the tonsils; nasal polypus; naso-pharyngeal polypus.

Simple Chronic Coryza.—The symptoms of chronic coryza are—permanent stuffing of the nose; alteration of the voice, which becomes more or less nasal; an abnormal secretion, giving rise sometimes to an abundant discharge, sometimes to dried and firmly adherent crusts. The senses of smell and taste are dulled; there is often a still more distressing symptom, the unpleasant odour of the expired air. The obstruction of the nose, when complete, is followed by the results of oral respiration.

Here we may make the mistake of confounding adenoid tumours with a case of coryza; but this danger is not the chief one, the first of these affections being comparatively unknown, we are led to look on the case as one of simple coryza, where the naso-pharynx is the site of the characteristic morbid growths. Further, if we

remember that these growths are often complicated with chronic rhinitis, the frequent error that attributes all these symptoms to this latter affection will be found still less surprising.

In cases in which this similarity of symptoms exists we have but one advice to give, that is, to practise physical examination of the naso-pharynx, in all patients presenting symptoms more or less resembling those of chronic coryza. I recommend especially palpation, for while the rhinoscopic examination often only succeeds after many trials, this latter can always be employed *extempore*, and it immediately solves the difficulty. In the case of adenoid tumours the naso-pharyngeal cavity is found diminished, or even abolished, filled by the morbid growths, or by exuberant excess of the pharyngeal tonsil. In the other case the finger moves easily in the interior of a free cavity, at times restricted only by the posterior swollen extremities of the inferior turbinate bones. In this latter case the examination of the nasal fossa by the anterior or posterior nares (rhinoscopy) will enable us to recognise the nature and extent of the chronic coryza.

Many authors, and amongst them distinguished surgeons and physicians (beginning with Dupuytren and Robert), have described cases of hypertrophy of the tonsils that exhibited functional troubles, closely resembling those characteristic of pharyngeal adenoid tumours. In these cases the great increase in the size of the tonsil is considered to be the only cause of these disorders.

This mistaken view is so general that a great number of patients affected with adenoid growths have been sent to us as merely suffering from hypertrophy of the

tonsil. Nor has the importance of a correct diagnosis been dwelt on by some authors as we might have expected.

In a great number of patients who have been brought to me as attacked by simple hypertrophy of the tonsils, causing deafness, mouth respiration, &c., even the most superficial examination of the throat decided the question in the negative, immediately showing that the tonsils are not sufficiently enlarged to interfere by their volume with the functions of the soft palate, or the nasopharyngeal passage, &c. There is nothing easier than to recognise the exact nature of such cases.

But it becomes extremely difficult when there really exists excessive enlargement of both tonsils, and at the same time the symptoms that we have described are present. It is here that I undertake to prove the incorrectness of the general opinion that regards these symptoms as a necessary consequence of this enlargement. I may mention, in the first place, that I have often seen cases of enormous hypertrophy of the tonsils which were free from all appreciable trouble, especially nasal respiration and the important consequences which result from its suppression. On the other hand, in some cases of hypertrophy of the tonsils, in which these troubles also existed, I found adenoid growths hidden behind the enlarged tonsils. On the removal of the tumours the symptoms disappeared, while the tonsils, to which these unpleasant results were attributed, have not been interfered with.

I cannot help thinking, that in most of the cases of hypertrophy of the tonsils which have been quoted as presenting the group of abnormal phenomena already described proceeding from the naso-pharynx, adenoid

tumours must at the same time have existed in this region, and that these were the cause of so many injurious results. I should even be tempted to ask the question, whether hypertrophy of the tonsils can really provoke the suppression of nasal respiration, as is generally believed, if we had not met with some cases where such hypertrophy has had this effect. [I can recollect several cases in which relief from nasal respiration and snoring at night, &c., has followed removal of the tonsils.—*Author.*] M. Desnos, for instance, in his article in the "Dictionnaire" (*a*) says, "The soft palate, raised horizontally, partly obstructs the posterior aperture of the nasal fossa; the tonsils, pushing the swollen and elongated uvula before them, almost come in contact with each other in the median line, and leave only a very narrow space for air and food."

I admit that the question is an open one. I think, however, that it will be well to ascertain whether in many cases it has not been an error to ascribe an evil to the tonsils, the real cause of which is found in the existence of adenoid tumours, and more particularly in an excessive development of the pharyngeal tonsil. Perhaps this is the clue to the frequent want of a successful result after removal of the tonsils.

I can only repeat the advice to employ physical examination in every case of considerable hypertrophy of the tonsils, accompanied by the group of symptoms which we have described. This examination immediately shows us whether there are adenoid tumours or not; and when we are informed on this point, an attentive study of the symptoms will enable us to decide which is the impediment that must be removed

in order to restore to the patient the integrity of the naso-pharynx, and the organs depending on it.

The interruption of the passage of air by the nasal fossa, and the alteration of the voice, are results common to both adenoid tumours of the pharynx and nasal polypus, when either of these two affections has attained a certain development. How are they to be distinguished? Physical examination will immediately elucidate the diagnosis by proving the existence of the characteristic excrescences in the naso-pharynx, in the one case, or in the other by showing that there are one or more tumours in the interior of the nasal cavities. Polypi are visible by examination of the nasal fossa anteriorly; it is not necessary to resort to the rhinoscope in most cases.

While adenoid tumours are formed usually in childhood and youth, nasal polypus is found at all periods of life, more usually in adult age. Often the patient is first aware of the presence of a polypus by a sense of obstruction and the sensation of a foreign body in the nasal fossa, a sensation which is not present in the adenoid affection. The deafness, which is an almost constant accompaniment of this latter, does not usually co-exist with nasal polypus, while a derangement in the excretion of tears is frequent. Polypi often ultimately project from the anterior or posterior apertures of the nose; adenoid tumours never reach beyond the pharynx, their seat of origin.

When tumours of the nose have attained such a development that the nasal fossa can no longer contain them, they grow beyond their position, frequently to an enormous extent, and finally invade the adjacent cavities. Disorders then rapidly follow, so grave and

so characteristic that the nature of the case is evident to the most inexperienced observer. To the arrest of the sense of smell are rapidly added troubles in mastication, in deglutition, and in the integrity of the ear; finally, life may be menaced, and safety can only be obtained at the cost of a serious operation. Even then there may be relapses—an occurrence as yet unknown in the case of adenoid tumours when once the surgeon has succeeded in removing them.

I will only refer to the cases in which *soft polypus* exists, arising from the posterior extremities of the inferior turbinate bones, with or without the simultaneous existence of adenoid growths. The treatment is the same in the one case as in the other, and an error in diagnosis between the two can, consequently, be of but little importance.

In proportion as naso-pharyngeal fibrous polypus becomes developed it encroaches successively on the interior of the pharynx, the nasal fossa, and the adjacent cavities, such as the frontal sinus and the orbit, everywhere producing the most distressing effects. When once this degree of development is attained, and these terrible results are definitely established, there can no longer be any fear of confounding this affection with adenoid tumours, which are neither of rapid growth nor of a destructive nature.

But while the dimensions of the polypus keep it within the limits of the naso-pharynx, the diagnosis may be attended by great difficulties. There are some facts that may assist in distinguishing between the two affections in question; this distinction is of the greatest importance, since adenoid growths are relatively harm-

less when compared with naso-pharyngeal polypus, which is of a most destructive character. This latter generally (some authors say "always") springs from the periosteum of the inferior surface of the basilar process, where, in the normal condition, the fibro-mucous membrane is enlarged*; adenoid tumours may spring from every portion of the walls of the naso-pharynx, and are inserted more superficially in the soft parts. They are generally first developed at an early age, while polypi appear usually between the fifteenth and twenty-second years (Nélaton).† These latter (according to Nélaton, M. Gosselin, and a great number of other experienced surgeons) are observed only in young boys; adenoid growths attack both sexes indifferently. Polypus gives rise to difficulties in deglutition, accompanied by the regurgitation of fluids into the nose, to nausea, to nasal discharge often tinged with blood, and even to hæmorrhage, to habitual dyspnœa, occasionally accompanied by wheezing, and interrupted at times by actual attacks of suffocation.

In short, the differential diagnosis between these two affections may offer serious difficulties, especially when we are examining a small polypus (or a mucous or granular polypus, another form of naso-pharyngeal tumour); but when neither the symptoms nor the optical or tactile methods of examination can afford us absolute certainty, we must then proceed to the removal of the tumours by surgical means.

Prognosis.—What becomes of adenoid tumours once

* "Lorrain, Bull. de la Soc. de Chir.," 260, 1860.

† [I have just removed at our county hospital an enormous polypus growing from this situation; age of patient twenty-five years.—*Author.*]

they have attained their maximum development? It is not easy as yet to reply to this question in a decisive manner, as I have not been able to follow the course of a large number of cases, or to observe them for so prolonged a period as to enable me to follow clearly their spontaneous evolution.

However this may be, it is certainly true that pharyngeal adenoid tumours are usually developed in childhood and youth, and become more rare in proportion as age advances, but as neither these tumours nor any of their habitual consequences are ever fatal, it would appear as a consequence that *that they may disappear spontaneously at a certain period of life*. Developed in childhood, they remain stationary during youth, and finally disappear spontaneously, although their complications, more or less serious, still remain.

We know that hypertrophy of the tonsils sometimes disappears spontaneously towards the age of puberty without artificial interference, as similarly we see mucous polypus of the nose atrophy, without either medical or surgical treatment (see on this subject the works of Robert, Nélaton, and M. Gosselin). It further appears that chronic catarrh of the naso-pharynx and of the nose, resulting in hypertrophy of the mucous lining of these cavities, frequently in proportion as the patient advances in age, leads to atrophy of the same mucous membrane. According to some authors, the pharyngeal tonsil itself, an abnormal development of which forms the substratum of so many adenoid tumours, appears to diminish in volume from infancy to advanced age (see Von Teutleben).*

* "Archiv für Ohrenheilkunde," xii. 1601.

Analogy supports the hypothesis of the spontaneous retrogression of adenoid tumours, no positive fact has as yet been discovered that proves its truth.

What I have said of the greater frequency of adenoid tumours in youth applies strictly only to the period of their origin, for they are met with in persons much more advanced in life. I had a proof of this assertion in a case where I found the morbid growths in 1865, the patient being then forty-one years of age. He refused efficient operative treatment, and I have lately verified the presence of the tumours, the patient being now fifty-three years of age. According to my observations in other cases, the affection when treated in an adult appears far more obstinate than when treated in a child.

Although adenoid tumours, once they are radically destroyed by one of the methods which I shall explain shortly, never recur, so far as I have observed up to the present time, operation, which constitutes the *sine qua non* of all treatment, does not remedy all the deleterious results of the affection. In order to accomplish this we must employ special measures.

It would appear that the influence of adenoid growth on the hearing may be exerted in two different ways; first, by keeping up an irritation in the pharynx, which easily extends to the middle ear; secondly, by mechanically obstructing the entrance to the Eustachian tubes. With regard to the first mode of action, any inflammation, whether acute or chronic, which commences in the pharynx, often extends to the mucous membrane of the Eustachian tubes, and even, at length to that of the tympanic cavity. The same may be said of the inflam-

mation that always accompanies adenoid tumours in this region; its deleterious action may affect the ear, in the earlier stages of the affection, as well as in a more advanced one.

In the cases where the morbid growths have attained their maximum development, they may interfere with the orifice of the Eustachian tubes in such a manner as to prevent the renewing of the air contained in the cavity of the tympanum and the mastoid cells. Arising from that there would be a diminution in the volume of air, by the process which I have described under the name of *quasi-respiratory* change.*

Also, the obstruction of the tube by very large morbid growths may prevent the discharge of the fluid effusions secreted in the middle ear, in cases of inflammation; the retention of these secretions will lead to perforation of the drumhead, or even to disorders of a still more serious nature, as, for instance, mastoid abscess.

The *prognosis* of aural affections, arising from adenoid excrescences of the pharynx is *in general, very favourable*; this is an important point. They offer, I consider, more probability of a successful result than the analogous aural affections proceeding from other causes. This result is evidently due to the fact, that in these cases we can successfully attack the root of the mischief itself, often an impossibility in other groups of aural affections.

The first essential condition of success is always to

* See my memoir: "De l'Echange des gaz dans la caisse du tympan; considérations physiologiques et applications thérapeutiques." By Dr Löwenberg. Published in *Progrès Médical*, February 14, 1877.

remove, as soon as possible, the cytogenic tumours, which cause, or at least maintain, the aural troubles. If we operate sufficiently early, we shall surely obtain a complete and permanent recovery; but this successful result will be more problematical if we delay too long to interfere *manu armata*. Even if we operate at the earliest opportunity, it is essential at the same time to attend to the aural affection, guided by the nature of each case, and the degree of development to which the disease has attained.

The Deleterious Effects of Respiration by the Mouth on the Middle Ear.—I may here allude to the injurious action exercised on the health, and particularly on the condition of the ears, by buccal respiration, one of the most important results of the adenoid affection.

The views of Mr G. Catlin* are well known. This author, artist, and traveller lived for a long time amongst the Red Indians of North America, and has described their habits in an extremely interesting book. He has laid special stress on the fatal habit of breathing by the mouth, which he designates *malo inferno*, or "the most destructive of habits." Amongst two millions of Indians whom Catlin examined, he did not find one individual who breathed by the mouth, nor a single deaf one, with the exception of three or four deaf mutes.

Not one, among 150 chiefs, with whom he conversed, could remember, during the last ten years, a single comrade deaf, or even with defective hearing. Catlin attributes this to a practice of the Indian mothers, who

* "Catlin, History of the North American Indians."

close their children's mouths each time that they breathe through them.

The conclusions of Mr Catlin must be received with a certain degree of reserve, though we may admit the important part that this author attributes to oral respiration in the production of affections of the ear causing deafness.

Dr Cassells lays especial stress on the prejudicial effect of oral respiration on the integrity of the ear, and thus on the accuracy of the hearing power. When we perform the experiment associated with the name of Mr Toynbee (which consists of swallowing with the nose closed), the air contained in the naso-pharynx is rarefied; the effects of this extends to the membrana tympani, through the Eustachian tubes, since the pressure of the external atmosphere now predominating over the intra-tympanic pressure drives the membrane inwards.*

I avail myself of this opportunity to acknowledge the prior claims of an author who has not received the justice that he deserved. The first who advanced correct views on the phenomena which take place in the naso-pharynx during deglutition was M. Maissiat, whose degree thesis (of the year 1838) contains an excellent description of this physiological act. He supports his opinion by argument, but also by ingenious experiments, for which he first used a manometric glass tube, hermetically adjusted to one nostril, while the other was closed. He thus proved inward suction during the repetition of the act of deglutition, which was seen by the inward movement of a drop of coloured liquid,

* Wendt, "Krankheiten der Nasenrachenhöhle," in Ziemssen, *Handbuch der Speciellen Pathologie und Therapie*, p. 253, 1874.

closing the opening of the manometric tube. Although a résumé of this account is found in the physiology of Longet, the classical manual most widely circulated for many years, the conclusive experiments of M. Maissiat have, so to speak, remained unnoticed, so much so, that in 1853 Toynbee (On the Muscles which open the Eustachian Tube, in "Proceedings of the Royal Society," 1853) supposed that there was, on the contrary, at the moment in question, increase of pressure and a reflux current of air directed back towards the middle ear. Professor Politzer re-established the facts that M. Maissiat had laid down; he also proved them by the aid of a manometric tube, which he this time inserted in the external meatus, following the example of M. Fick. He thus recognised that the concavity of the membrana tympani was due to the influence of the rarefaction of the air in the middle ear which takes place during the repetition of the act of deglutition, when the nose and mouth are closed. This diminution of the pressure is only a result of what takes place at the same time in the naso-pharynx, and which may act under these special conditions on the gaseous contents of the cavity, through the canal of the Eustachian tube, which is considerably dilated at that moment.

. The consequent diminution of the hearing power continues until equilibrium is re-established by swallowing with the nose open, because then the interior of the cavity is in communication with the surrounding atmosphere, through the Eustachian tubes and the nasal fossæ, and, therefore, the equilibrium is easily obtained. But when the nose is permanently closed it is no longer possible to re-establish the equilibrium; each act of

deglutition can only agument the disorder, which finally is a permanent one.

This influence of deglutition on persons having the nose constantly closed, on which M. Lucæ, of Berlin, has laid great stress, is theoretically plausible; nevertheless, I am of opinion that the conditions necessary to cause this could only exist in cases where there was absolutely hermetic closure of all the nasal passages. According to my experience, the cases in which the passage of even the finest current of air by the nose is absolutely impossible are extremely rare; only those of nasal or naso-pharyngeal polypus, unusually developed. In most cases, even those most advanced, of pharyngeal adenoid tumours, the nose is so much obstructed as not to leave a sufficient channel for the volume of air necessary to respiration, but the obstruction is not complete; and since only a very small channel of communication is required to re-establish at once the equilibrium of pressure, any passage, however small, will be sufficient to prevent the unpleasant results mentioned above.

In conclusion, I think that the suction produced by the repetition of the act of swallowing, can only be prejudicial to the ear in those cases of hermetical occlusion of the two nasal fossa, which are extremely rare.

Diagnosis.—The symptoms I have described must not be considered as conclusive, although they render the presence of adenoid tumours very probable. The certainty of their presence can be gained in two ways: by rhinoscopic examination and by digital exploration.

It is often very useful, before proceeding with the rhinoscopic examination, to employ the naso-pharyngeal

douche to remove the secreted masses which encumber in a great number of cases the pharynx and nasal fossa.

Once the rhinoscopic image is obtained, the diagnosis is made immediately; nothing is more striking than these strange protuberances, which disfigure the ordinary aspect of the naso-pharynx.

Besides such positive results, the rhinoscope sometimes gives us negative ones by no means valueless; I have, for example, lately had two young patients in whom the nasal and throat symptoms gave reason to suspect the presence of adenoid tumours, when the pharyngeal mirror, which was extremely easily applied in both cases, showed that there was no trace of them.

In certain cases of marked glandular quinsy at the back of the throat, where we might expect to find this adenoid condition, the rhinoscope has shown me the upper pharynx in a normal condition, and proved that the symptoms observed must be attributable to other causes.

The method of palpation is as follows:—The index finger, bent, with the dorsal surface downwards, is introduced into the mouth, and hooked round the soft palate. Having reached the naso-pharyngeal cavity, the soft point of the finger explores successively the posterior openings of the nasal fossa, the lateral and superior surfaces of the pharynx, the entrances to the Eustachian tubes, and the postero-superior surface of the soft palate. Here we must practise the "*cito tuto et jucunde*," of the ancients, especially rapidity and gentleness, in order to ensure the absence of pain and nausea. Much delicacy and lightness of touch are necessary, especially when we

are examining a soft palate, which is easily irritated and much enlarged. This latter difficulty, although, according to my experience, less frequent than some believe, often interferes with digital examination; while we have in addition the reflex movements caused by the contact of the finger with these sensitive parts.

I prefer, in accordance with what I have explained in treating of the rhinoscope, to direct the patient to breathe by the nose, at the same time keeping the mouth open, while we then carry the finger round the soft palate. In attempting to accomplish this the patient is obliged to depress the organ, and this enables us to pass the finger at the proper moment. The nail of the exploring finger should be cut closely, and carefully filed, to remove all the edge, which would cause great pain to the patient. Notwithstanding this precaution, traces of blood are almost always seen on the soft part of the finger; they are due to the great vascularity of these morbid growths, and are even considered as characteristic in the diagnosis of these tumours. This, however, is not so, as I have often found in examining such cases.

It has been suggested to direct the patient to bend the head forward in order that the soft palate, in accordance with the laws of gravity, may fall further forwards. This method, intended to facilitate rhinoscopic examination, has been tried by me for digital exploration also, but I found that in neither of these cases did it attain the object proposed, and for this reason—that the head, when bent forwards, is brought nearer to the anterior surface of the vertebral column, and that thus the dimensions of the naso-pharynx are considerably dimin-

ished from before backwards in the antero-posterior diameter. I believe it to be better to direct the patient to incline the thorax forwards and the head backwards ; by this means we get the widest space between the soft palate and the back of the throat ; at the same time we secure the greatest distance from the surfaces of the cervical vertebræ, thus gaining as much space as the anatomical relations of these latter with the cranium will allow.

Digital examination thus enables us to judge of the condition of the posterior and superior walls and the lateral regions of the pharynx—a result which it is more difficult to obtain by the rhinoscope, for optical reasons easy to understand. Besides this, the finger gives us the parts in their relative position, as they really are, while, when reflected in the mirror, they necessarily appear fore-shortened, grouped in relation to one another otherwise than as they really are. Palpation also shows us whether the morbid growths are soft or hard—an important distinction when considering the method of treatment to be adopted. This method of examination is the more valuable since it almost always succeeds at the first trial, and consequently gives immediate results, which sometimes would not be obtained for a long time with the rhinoscope, enabling us to ascertain the presence or absence of the tumours, their site, their dimensions, their shape, and often their insertion, the rhinoscopic mirror, on the contrary, shows the condition of the mucous membrane, its colour, and the nature of its secretions, and with its assistance we can examine deeply into the nasal fossa. Moreover, we learn from it with greater certainty than

by palpation the existence of small tumours. We should then, so far as it is possible, employ both methods in the examination of the patient; the time employed and patience exercised will be more than recompensed by the accuracy of the diagnosis, and the possibility thus acquired of radically curing the affection.

I have still to devote a few lines to another method of diagnosis—the inspection of the superior pharynx by the nasal fossa. According to M. Zaufal and M. Michel, who have advocated it of late years, independently of one another, it enables us to recognise the presence of adenoid tumours. M. Zaufal* inserts full-sized specula, eleven centimetres in length, into the nasal fossa, until the extremity reaches the pharyngeal cavity almost as high as the entrance to the Eustachian tubes. There are instruments of different calibres for larger or smaller nasal passages. This method, in certain cases, enables us to examine the entrance of the tube and a greater or less extent of the mucous membrane of the nasopharynx.

I may add that it is sometimes possible to suspect—almost to diagnose—the existence of adenoid tumours *during catheterisation of the Eustachian tube*, when the beak of the catheter meets with a large and resisting mass in the region of the Eustachian orifice (compare our observations, *loc. cit.*, pp. 117–119), but we never can be certain except by pharyngoscopic examination, or by palpation.

Treatment, General and Local.—We may divide the

* Zaufal, in various papers inserted in the “Archives d’Otologie,” and in the “Prager Medicin Wochenschrift.”

therapeutics of adenoid pharyngeal affections under three heads :—

(a) Measures employed for the restoration of the general health.

(b) The surgical treatment of the adenoid tumours.

(c) Measures to be taken with regard to consecutive or concomitant affections.

Although we must rely almost entirely upon the local treatment, the cases are very rare in which it is not necessary at the same time to attend to the general health of the patient. Thus, for my part, I have seen but a very limited number of young patients affected with adenoid pharyngeal growths, amongst the considerable number who have come under our notice, who at the same time were exempt from some signs of a lymphatic diathesis. I combat this diathetic tendency by the usual treatment—good hygiene, plenty of exercise in the open air, and reasonable gymnastics, intended to improve both respiration and circulation, and finally, the general nutrition. Besides this I order tonic régime, cold baths, cod-liver oil, bitters, iodide preparations, iron, sea baths, and saline and sulphurous mineral waters. Milk diet is necessary to avoid all irritation of the pharynx. We must prohibit very hot or irritating food, whether liquid or solid, alcohol, tobacco, excessive use of the voice, breathing in impure air, &c.

Even where the patients present have no sign of such a diathesis, we have often recourse to these general measures to recruit the health, weakened by abnormal respiration and its effects on hæmatisation and nutrition.

We cannot effect a cure without the radical destruction of the adenoid growths, that is to say, local treatment takes the principal place among the means by which we contend with this affection. It can be accomplished in two ways—(1.) By cauterisation. (2.) By removal.

Cauterisation.—In certain cases repeated cauterisations are sufficient to destroy adenoid tumours. It is true that it takes far longer to obtain the result in this manner than by instrumental removal, but there are circumstances in which treatment by cauterisation is really the better method. In the case of sessile or flat morbid growths, tumours inserted on a broad base on which it would be difficult to operate with an instrument of any kind.

It is also indispensable when the patient or his parents, for this occurs usually with children, absolutely refuse all “operation,” and only permit cauterisations.

The instrument that I employ as a caustic holder is a cylindrical silver stem, 33 cm. in length, and with a diameter of 4 mm.

The part that we introduce, by the mouth, into the naso-pharynx, so as to enable us to touch its whole interior, is curved, to correspond with the longitudinal axis of this cavity, and when it is necessary to reach the roof of the cavity we can do so without coming in contact with the surrounding parts. This portion forms with the stem of the instrument an angle, similar to that which is formed by the axis of the mouth, and that of the pharynx. At the end of the curved part of the instrument there is an enlargement in the form of a quadrangular prism, 17 mm. in length, and 4 mm.

in width, the surfaces being roughened to ensure the adherence of the caustic.

M. Myer employs a caustic-holder of German silver, and uses instruments of various forms, roughened on different surfaces, to correspond with the several positions in the pharynx, on which the morbid growths are found; but Professor Politzer has rightly suggested that we should be satisfied with a single instrument, constructed as I have above explained, and roughened on all the surfaces. We must then charge with caustic only the surface which corresponds with the position of the tumours in each case.

The caustic-holder has a second curve at the end opposite to the prism. This end being held by the hand of the operator, the instrument is curved downwards, so as to leave a clear field for operation, in front of the patient's mouth.

The fused nitrate of silver is the only substance which has hitherto been employed; when the patients are little children, or are very troublesome, so that it would be difficult to accurately limit the action of the caustic, we weaken the nitrate by the addition of a certain quantity of nitrate of potash, an absolutely harmless substance: one part of the salt of silver is dissolved with two parts of the azotate of potash (according to M. Desmarres). Like pure nitrate this mixture can be well blended in a porcelain vessel, heated over the flame of a spirit lamp [or in a small platinum crucible sold for the purpose. Probes that can be bent to any shape, like the ordinary uterine probes, may be used, and answer the purpose admirably (*Author*)].

When once the position of the tumours is exactly recognised, we fuse the caustic, and plunge into it, either the whole, or some portion of the instrument, according as either the one or the other is necessary, in order that the portion covered with nitrate may correspond to the position of the growths, when the instrument has reached the pharynx. We must be especially careful not to dip the entire prism into the fused salt, except in the case where the morbid growths occupy the whole interior of the naso-pharynx; otherwise, we risk cauterising unintentionally the parts that do not require it. We cauterise with the aid of the rhinoscope. When dealing with patients in whom this is impossible, as they cannot tolerate the pharyngoscopic mirror, long enough for the cauterisation, we must have recourse to palpation. The left index finger, carried into the naso-pharynx, directs and limits locally the application of the instrument, it presses the portion covered with nitrate against the morbid growth, which is cauterised by contact with the prism or by rubbing it lightly with a to-and-fro movement.

When we think that the caustic has been sufficiently applied, or that the patient becomes restive and anticipates the surgeon, we rapidly withdraw the instrument, taking care to carry its extremity exactly in the middle line of the pharynx, to avoid all useless contact. Frequently the patient raises the soft palate, in this manner rendering the operation impossible. We then proceed as I have already described, and this manœuvre generally removes the impediment, which previously was insurmountable. This applies equally to cauterisation as to other operative measures that I shall describe.

Such is the ordinary method, which it is not always easy to accomplish : many patients, especially children, whether from nervousness or irritability of the pharynx, only tolerate a very rapid application of the caustic, and there is not time to introduce the finger previously.

If we persist, we run the risk of causing contractions of the pharynx, thus exposing it to cauterisation alike on the parts which are affected, and those which are normal.

I have succeeded in avoiding this difficulty by capping the prism to which the nitrate is adherent with the end of a caoutchouc tube, 2 cm. in length, and from 6 to 7 mm. in diameter ; having reached the morbid growths, we apply them to the end of the instrument, permitting only the caustic to come in contact with the affected part.*

When the cauterisation is finished we withdraw the instrument, and the result of this movement generally is that the caoutchouc, striking against some projection in the pharynx, glides over the cauterising surface of the prism, and thus covers it, or at least the projecting edges of the tube, protect the pharynx from all injurious contact.

This method is easy of application, particularly where the tumours occupy the roof of the pharynx (hypertrophied pharyngeal tonsil), or the adjacent parts, and according to our experience, this is their position in the greater number of cases.

Another point appears to me important to mention, on account of the inconveniences, even the dangers,

* There is an account of my method of using Politzer's insufflator in an article by the late M. Consin : "Mémoire sur un nouveau procédé pour injecter de l'air, &c., dans les trompes d'Eustache, &c." (*Bulletin général de Thérapeutique*, 29 February 1868).

which would arise from neglecting it. While the layer of nitrate of silver (pure or weakened) remains in contact with the morbid growths, their surface gives rise to a very abundant secretion, which always dissolves a greater or less portion of the nitrate. This solution ultimately flows down in accordance with the laws of gravity, and it may thus easily happen that after a time, and quite unintentionally, we cauterise the digestive tract to a surprising depth. It may even happen (and this gives far greater cause for uneasiness), that the caustic reaches the entrance, or sometimes the interior of the larynx. These accidents are not the less injurious because they are rare. They are sometimes not discovered until after the surgeon has left the patient, or *vice versa*, and therefore immediate relief is impossible.

I have been in the habit of guarding against any accident of this nature by employing after each cauterisation of any length two methods intended to remove all the superfluous nitrate of silver, one acting by the nose, the other by the mouth. These are—the naso-pharyngeal douche, and gargle used in a special manner. A mixture of salt and water is employed, which immediately precipitates the silver, in the form of insoluble chloride, and is rejected by the patient in the form of cheesy white flakes.

The advantages of the naso-pharyngeal douche method are very great, and of general application; it would be desirable to see it more universally employed.

This douche is equally useful in the therapeutics of adenoid tumours, and also during their surgical treatment, whether it be to prepare the way for operation by removing the secretions of the nose and of the pharynx,

which are generally very abundant, or to apply hæmostatics or substances intended to limit the action of the caustic by neutralising any that remains in excess after its application.

As the employment of this method does not always succeed at the first trial, we must begin by accustoming the patient to its use, which sometimes requires a certain amount of patience and time ; we should, however, persist in the attempt, and *I consider it very imprudent to proceed to surgical interference* without having previously familiarised the patient with the use of the douche. It is a precaution I have not found insisted on elsewhere.

Unfortunately, the use of this douche is extremely difficult, if not impossible, in cases where very large morbid growths exist, as these obstacles do not permit the passage of the liquid from one nasal fossa to the other.

We must be satisfied in such cases to accustom the patient at least to tolerate the injection so far as the nasal pharynx, and to allow it to remain there, if only for a short time.

But I repeat that I regard it as a condition *sine quâ non* that we should accustom our patient, at least, so far to the use of the douche, before performing any operation in this region, in order to be prepared for cases in which considerable hæmorrhage may arise, or those in which there may be simply an excess of the caustic ; without the naso-pharyngeal douche it would be very difficult to guard against these two accidents. It is useful to combine with it the action of the gargle.

I recommend the use of the gargle in the following manner:—The patient inclines the head horizontally

backwards, and performs movements that we may style “quasi-deglutition,” not including the last portion of the physiological act—those of swallowing. The liquid is passed much higher behind the soft palate than the ordinary method of gargling will permit; some persons succeed so well in this manœuvre that they are able to reject by the nose the liquid which has been received by the mouth. [I always direct the patient to gargle while lying on the back (*Author*).] Moreover, these rapid muscular contractions completely detach the abnormal secretions, which can then be easily expelled, and the greatest possible relief is thus given to the patient.

Before proceeding to cauterisation, prepare the warm water with common salt in order to have at hand, in case of necessity, the means of neutralising immediately an excess of nitrate.

If the pain is too intense, or too prolonged, the action of the caustic may become too severe, or extend too far; to neutralise further action of the nitrate of silver, we must then consecutively use the nasal douche and the gargle. The saline solution used warm in the case of the douche, or barely tepid, when gargling will prevent this effect.

A fragment of nitrate of silver may become detached from the instrument and remain entangled amongst the numerous excrescences so frequently found in certain forms of adenoid growths; notwithstanding every precaution this accident has already with me occurred to patients on three occasions. We may suspect its occurrence first by examining the caustic holder, which shows us that the whole, or a portion, of the nitrate salt with which it was covered has become detached; also,

by a persistent and increasing pain, complained of by the patient, which may be easily distinguished from that which should attend the degree of cauterisation aimed at. In addition to a too severe action, the nitrate might, in substance, or dissolved, descend into the stomach or into the respiratory passages, and there cause mischief.

I have avoided this in the three cases to which I have referred, by the following method, which appears to me both necessary and efficient in cases where this accident occurs :—

I employ the naso-pharyngeal douche and gargles of salt and water; the patient should even swallow some draughts of water containing sea-salt in solution; nor do I leave him till I am absolutely sure that the toxic substance is completely neutralised, or till I have seen it rejected. The cauterisation should be repeated after the sloughing and the inflammation caused by it have disappeared. In some patients this takes place within twenty-four hours; in others, very much more slowly. We can ascertain the disappearance of the slough by means of the rhinoscope, where this is possible, and the cessation of the accompanying irritation by the same means, or by the patient's sensations.

The number of applications necessary for a complete cure naturally varies, according to the size and consistence of the morbid growths, also according to the tolerance of the individual; a considerable time is often necessary to ensure complete recovery.

Removal of Adenoid Tumours.—Those who have studied this subject have practised the removal of adenoid growths by different methods. After having

tried their modes of operation in a great number of cases, I have been induced to devise a *new method*, which appears to possess some advantages, and which I shall explain when I have described those already in use.

(a) *The Use of the Curette with sharp edges.*—The use of a curette with sharp edges is a method which has often given good results. My instrument more or less resembles a small spoon with sharp edges, 1 cm. in length and 7 mm. in its transverse diameter, at the extremity of a stem, made like itself of steel, 15 cm. in length. This is formed in a double curve, analogous to that of the caustic-holder, and, like it, resembling an **S**; the first curve is at the end to be introduced into the mouth; it enables us to avoid the soft palate with the curette and to reach the roof of the pharynx; the other curve is at the junction of the stem with a strong ebony handle. It forms, like the first, a very obtuse and rounded angle, but pointing downwards, while the other end is directed upwards. The former of these two angles prevents the hand of the operator from interfering with the field of vision, as in the case of the caustic-holder.

When we wish to use the curette we commence by depressing the patient's tongue; if he cannot succeed in this himself we depress it with an instrument *ad hoc*. We then introduce the pharyngeal mirror, and guided by its aid we operate. In patients who do not submit to this kind of examination we should introduce the index finger into the pharynx in order to fix the adenoid tumours, and at the same time to guide the instrument with which we operate towards them. I use the curette with the right hand. The morbid growths are removed

by the pressure of one of the edges of the little spoon, or by a kind of scraping shaving movement.

I have also met with a certain number of cases, not mentioned by other authors, in which the patient cannot tolerate, even for the shortest period, the presence of the finger, or of the rhinoscopic mirror. I then proceed in the following manner:—I first ascertain by rapid digital examination the exact position of the growths, and then withdraw the finger, immediately replacing it by the curette, with which, before removing the tumours, I carefully assure myself afresh of the position of the parts on which I am about to operate. We must be cautious to cap the end of the instrument with a piece of caoutchouc tubing. At the moment of excising the tumours, we remove this protection with the index finger in those who permit its introduction, or by simply pressing the instrument, and thus withdrawing the elastic-tube.

The hæmorrhage that follows this operation is sometimes considerable, on account of the great vascularity of these tumours, but it never resists the application of the naso-pharyngeal douche, applied either through the nose or by the mouth, with water nearly cold, or with a solution of alum. Its use, however, involves a fresh operation, however slight, which a patient, already enervated by the preceding operation, would prefer to avoid. It is not usually necessary to apply any subsequent treatment to the parts from which the growths have been removed, but sometimes slight cauterisations may prove useful in effecting a final cure.

(b) *Snaring and Crushing*.—We may operate on the growths by the snare when they are pedunculated, and

by crushing or bruising when they are sessile. In the first case I use a very resisting steel wire passed round the pedicle, with which I remove the entire growth by snaring it. The instrument must be strong and curved, so that it may reach the roof of the pharynx, passing behind the soft palate.

Instruments of this nature, although constructed differently, are always based on the same principle, and they resemble, except as regards their strength and their special curvature, the *écraseur* of M. Maissoneuve, and that of Wilde (of Dublin) devised for operation on aural polypus, and which we very frequently employ with complete success.

Sessile tumours may be operated on by the aid of a polypus forceps, curved suitably for this special purpose. The tumour must be seized between the teeth of the instrument, which compresses it forcibly, in order to crush it. The pressure is then relaxed and the instrument withdrawn, leaving a mass of *débris*, which will fall away of itself; the crushing should be repeated if necessary after the inflammation caused by the preceding operation has ceased, and the tissues by the great pressure have been destroyed. The forceps used by Stoerk* differs from other instruments of this nature, each branch being divided into two parts, united by a joint. In order to employ this forceps, we place these two pieces at an angle which will facilitate its introduction; when the instrument is *in situ*, and after it has grasped the tumour, M. Stoerk straightens it by means of two wires, so that the two portions of each

* Prof. Karl Stoerk, "Klinik der Krankheiten des Kehlkopfs," &c., fig. 37, p. 98, Stuttgart, 1876.

branch together form only one straight line. It would seem as if this would injure the soft palate, which is thus violently drawn forward.

The forceps used to crush the sessile tumours may be used to strangle the pedicles in the first class of morbid growths, thus removing them at one visit.

Löwenberg's Forceps.—I have invented with this double aim *a modification of my cutting forceps*. The sharp blades of the instrument are replaced by strong toothed bits, which will enable us to strangle or to bruise the growths as we have explained.

Thus modified, my instrument is very easily manipulated, not alone for the growths of which I speak, but also for true pharyngeal polypus.

In alluding to the precautions to be taken, while snaring the growths, in the use of the rhinoscope and palpation, against the dangers of hæmorrhage, &c., I have but to repeat what I have previously said while considering operation by means of the curette. In certain cases of tumours of very soft consistency, I sometimes succeed in crushing them by the *pressure of the finger*; this must be repeated till the recovery is complete.

M. Meyer recommends operation by means of a little oval ring with a sharp interior and anterior edge.

This little instrument consists of a thin flat blade, only 2 mm. in breadth, it is 1 cm. in its transverse axis, and 7 mm. in their axis perpendicular. The ring is fixed at a slight curve with a strong metal handle, 11 cm. long, at the extremity of which is an ebony stem of the same length.

The instrument is used in the following manner:—

We introduce it with the right hand, by the nares, on whichever side enables us most easily to reach the morbid growths, till it is passed into the pharynx; then the left index finger is introduced by the mouth, in order to fix the morbid growths, and to press them against the sharp edges of the knife.

As regards the value of this instrument I must confess that I have often found it useless, because I found it impossible to pass it by the nasal fossa, or at times it caused too much pain to the patient, or the situation of the tumours was such that they could not be reached by the knife, the space in the interior of the nose being restricted to allow of free manipulation of the instrument. (I must add that Wendt saw, in two cases, the use of this annular knife followed by acute purulent otitis with perforation of the membrana tympani.)

Amongst the various operative methods that I have employed, the use of the curette appears to me the easiest and most efficient, but nevertheless it is not without its drawbacks. The introduction of this instrument, with sharp edges, may indeed become dangerous in cases where the patients are restive or unmanageable, even when we take the precautions I have explained (see above). Moreover, when it is introduced

Fig. 51.

Cutting-ring for
Adenoid Growths.

into the naso-pharynx, the curette may make an incision so deep as to extend below the limits of the tumour which is to be removed.

I have thus been induced to substitute, for the instruments already known another of my own invention, which I believe to be as efficient, while it is more sure in manipulation, and less distressing to the patient than these.

It is a forceps, the extremities of which are two sharp blades, the cutting edges being applied against one another, when the instrument is closed (fig. 52).

Guided by the rhinoscopic mirror, or by the index finger of the left hand, I introduce the forceps closed; I then open it and cut the growths as closely as possible to their base. A thin pedicle, or a sessile growth of small size, may be cut through by one stroke of the instrument, while it will naturally require several to remove a large tumour. True pharyngeal polypus can be operated on in a similar manner by means of my instrument.*

When the morbid growths are divided we withdraw the closed forceps, and with it generally also the tumours that we have just removed.

Having frequently employed the forceps with complete success, I can recommend its use to those who find it necessary to operate on adenoid tumours or polypi of the pharynx.

Adenoid tumours may be also destroyed by a platinum wire rendered incandescent by the continuous current. I cut through the pedunculated growths with the sharp

* Fig. 53, which explains itself, represents an admirable forceps of Dr Morell Mackenzie for the same purpose.—(*Author.*)

snare, and destroy the sessile ones with the galvano-cautery.

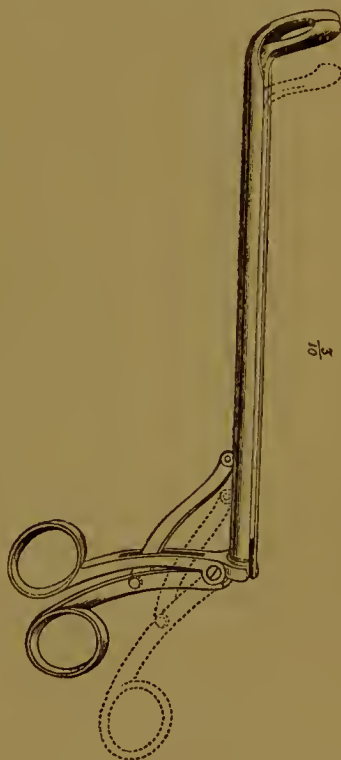
I have not yet tried the thermo-cautery in these special cases. When it is employed I should suggest to

Fig. 52.



Löwenberg's forceps
(post-nasal).

Fig. 53.



Mackenzie's forceps
(post-nasal).

cover the instrument, except that portion with which we cauterise the tumours, with some material which does not radiate heat, and is at the same time a bad

conductor. In the same way the galvano-cautery, so as to protect the healthy parts, I should cover thus the circumference of the shank for the platinum wire.

I wish only to refer briefly to the treatment which, by long personal experience, I have found useful in some concomitant affections where there are adenoid tumours in the pharynx.

We have seen that chronic inflammation of the mucous lining of the pharynx and the cavities adjacent to it, co-exists in a great number of cases with adenoid tumours of the posterior cavities of the nasal fossa; we have pharyngitis, and very often rhinitis.

It is necessary to treat these different affections independently of the measures to be taken with regard to the adenoid tumours themselves.

Naso-pharyngeal Injection.—When the affection has attacked the *nose or the nasobuccal pharynx*, I use *alum*, an excellent astringent, as a gargle, and through the naso-pharyngeal douche. The *gargle* is used at the temperature of the surrounding atmosphere.

We must take special precautions to ensure the success of this excellent method, by avoiding the use of pure water without the addition of some salt; for simply cleansing injections we use water containing chloride of sodium, 1 to 3 parts in 100. I also add salt to the astringent solutions, for without it the water is very irritating to the pituitary membrane, probably on account of a too violent osmotic process; while table-salt possesses a very slight osmotic action, and limiting that of certain other salts, prevents the exaggerated interchange and consequent irritation, which would

take place between the fluid injected and the elements of the Schneiderian membrane.*

Alum is used in the nasal douche, in the proportion of 1 to 3 parts in 100 of water. All medicated fluids should be warm, so as to avoid irritation of the nasal mucous membrane. The astringent may be used also in powder, but we then lose the cleansing effect of the current of water, which is indispensable in carrying away the secreted products, often so abundant, compact, and adherent, that without the aid of Weber's douche, all the efforts of the patient cannot succeed in expelling them.

If alum, or other astringents, as, for instance, tannin, are not sufficient to effect a complete cure, we may increase their action by local cauterisation; we must have recourse to this where pharyngeal granulations exist, or actual swellings of the pituitary, such as we have often noticed. I very frequently use the galvanocautery for these cauterisations.

It is evident that we cannot hope to re-establish respiration by the nose until the adenoid tumours which interfere with this normal function have been removed. But as we have already seen, operative measures are not sufficient to accomplish this successful result in the greater number of cases; even after the pathological condition of the nasal fossa, which has interfered with the permeability of these channels, has been cured, the habit of the young patients of breathing by the mouth often remains still unconquered. On the other hand, the re-establishment of the normal method of respira-

* Graham, in *Philosophical Transactions*, 1865, part 1, "On the Diffusion of Liquids."

tion is all the more desirable, as the simple fact of the passage of air through the nasal fossa, would, in its turn, materially assist in restoring their physiological condition.

In these cases, when the passage is sufficiently free, I begin by advising those who are in charge of the child to check his old habit by constantly reminding him to close his mouth. It is all the better if the child finds this surveillance annoying. He will then attempt to render it unnecessary by remembering of his own accord to breathe by the nose.

M. Guye, of Amsterdam,* proceeding more energetically, proposes simply to close the child's mouth by means of an apparatus somewhat similar to the respirator of the English, but differing in this respect, that the "anti-respirator" of my Dutch friend is completely impermeable to air.

But this apparatus will not be efficient unless it is applied so closely that it adds to the little patient's annoyance by preventing him from speaking. Moreover, it may happen in these cases that the nose, particularly if the mucous membrane has not completely regained its normal condition, is temporarily closed, and how can the child who has been strictly forbidden to remove the apparatus then breathe? And how can he expel the pharyngeal secretion, which is generally so abundant, or even the saliva? These questions are all the more important, since, instead of losing time which should be utilised, we ought to begin the supplementary treatment as soon as there is the least possibility of breathing by the nose.

* International Congress of Medical Science, Brussels, 1875.

I have devised a more gentle means which has already been serviceable in some cases. It is the use of a simple chin-piece, but I replace the end that passes round the scalp by two bands, making between them almost a right angle, so as to bind the head firmly, there is a slit in the inferior portion for the reception of the chin. This chin-piece brings the two jaw-bones with their dental arches in contact with one another, thus preventing respiration by the mouth. In cases where a small opening still exists, it is only because there are spaces between the teeth of the same row, or behind the last molar teeth come out; not only are these spaces insufficient to serve for regular prolonged respiration, but, if availed of, it would be also very troublesome, as it would necessitate the patient keeping his lips separated, while the chin-piece tends to close them by pressing the inferior against the superior maxillary bones. This mode of breathing may be used for a short time if the nose is temporarily closed. It has, moreover, the advantage of permitting the patient to speak sufficiently. All that I have seen up to the present appears to prove that this device may with gentleness teach a child to breathe by the nose without imposing on him a restraint beyond his age.

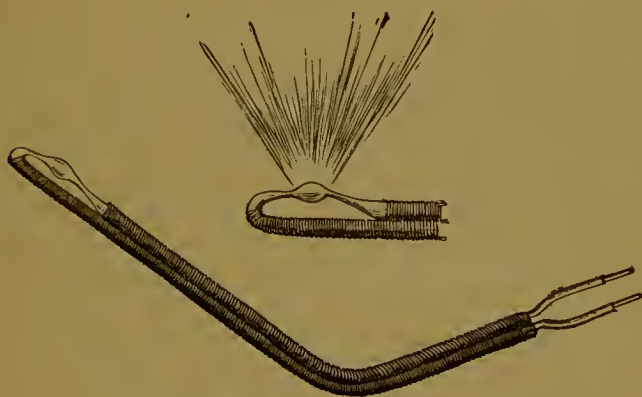
Where snoring does not disappear spontaneously, as soon as the naso-pharyngeal passages have recovered their normal permeability, the chin-piece should be still used, but only during the night. Defective pronunciation should be conquered by reading aloud, an exercise which is also very useful for the whole extent of the respiratory tract, as it stimulates and regulates the mechanism of respiration.

As to the thoracic deformity, suitable gymnastics should be tried under the supervision of a doctor especially familiar with orthopædic surgery, and its anatomical and physiological basis. The earlier it is used the greater will be the chance of a successful result. Electricity may be used with advantage in the treatment of the deformity.

In a recent communication to "L'Union Medicale" (July 1881), Dr Löwenberg urges strongly the advantages of the galvano-cautery in coryza, attended with hypertrophic swellings of the Schneiderian membrane, and for restoring the nominal calibre of the nasal fossa. The application of the cautery is not attended with much pain, nor is there any inflammatory reaction. Even in infants at the breast, where the impediment to respiration is most unpleasant, Dr Löwenberg does not hesitate to use the galvano cautery to restore the nasal respiration. Three or four applications of a few seconds duration he finds sufficient. Dr Löwenberg thus describes the special advantages of his method of operating and cautery used by him. Certain precautions are necessary. A good illumination with the careful localisation of this cautery to the affected parts; the speculum of Duplay is chosen, but Dr Löwenberg prepares one with thin blades, so as neither to hurt in its introduction, nor to obscure the view. The handle of the cautery is so bent as not to interfere with the hand. The cautery is applied before the current is passed, and securely placed in position. The septum should not be touched, inasmuch as it does not at any time participate in this affection. Dr Löwenberg thinks that many accidents have occurred from burns of the septum, and therefore

involuntary movements on the part of the patients must be watched for and guarded against. The temperature at which the cautery is applied cannot with some instruments be controlled, and hence more tissue is destroyed than is either intended or wished for. The galvano-cautery of Dr Löwenberg is here figured. The cauterising plate of this instrument is placed not at the

Fig. 54.



Löwenberg's Galvano Cautery.

extremities but laterally. We thus avoid running the risk of wounding the septum by applying this lateral blade carefully against the part. In infants, or restless patients, it is better to press the platinum plate above or beyond the part to be cauterised before completing the current, and then to cauterise in withdrawing it. We must have two instruments, one for either nostril, with the plate differently placed for each. A Trouvés' battery is employed. Dr Löwenberg uses the same cautery for reducing hypertrophy of the tonsils.

CHAPTER XIV.

POST-NASAL CATARRH.

This affection occurs in two forms, the one moist, the other dry. The former occasions but little inconvenience. The mucous membrane of the posterior wall and vault of the pharynx is slightly swollen, and more or less covered with thick tenacious mucus of grey or yellow colour, if not blackened by city air. The patient is troubled by a constant pouring down his throat. The affection often passes away spontaneously, but sometimes proves rather obstinate, getting better or worse from time to time, almost disappearing in warm dry weather, and again becoming troublesome in wet or cold weather. In such cases, a stimulating application of chloride of zinc (gr. xx. ad. $\bar{3}$ ij), perchloride of iron ($\bar{3}$ i ad. $\bar{3}$ ij), or nitrate of silver (gr. x. ad. $\bar{3}$ i) will prove beneficial. Stimulating inhalations of pine or juniper inspired through the nose also greatly assist in effecting a rapid cure.

The dry form of post-nasal catarrh gives rise to much more disagreeable symptoms, and more frequently occasions deafness. On examining the throat, the back wall and vault of the pharynx, and more rarely the superior turbinate bones are seen to be dry and shining, or covered with a thin yellowish brown adherent crust of mucus. When the membrane is merely dry, it

is seen to be of a bright red colour, and in those cases in which there is an adherent secretion, the mucous membrane will be seen to be red if the discharge be removed. The mucous membrane for some distance round is generally much inflamed, and its veins and capillaries are in a turgid condition. Sometimes, owing to the secretion undergoing certain putrefactive changes, a peculiarly disagreeable odour is exhaled by the patient. This, in fact, constitutes the commonest form of ozæna. The complaint has sometimes been described as atrophic catarrh, but the disease may go on for many years without the slightest loss of substance taking place. For the cure of this form of the disease, it is of the utmost importance that the adherent secretion should be entirely removed. This can be most effectually done by spraying the part with an alkaline solution to which a small quantity of carbolic acid has been added. The following formula will be found serviceable:—

R	Acid Carbol.	.	.	.	.	.	℥ xv.
	Soda Carb.	.	.	.	.	.	℥ ij.
	Ag. ad.	.	.	.	.	.	℥ viii.

After the crusts have been got rid of, the parts should be freely swabbed with a solution of nitrate of silver (℥i ad. ℥i). The patient should be taught to apply it himself, as it ought to be used three or four times a day, indeed the crusts should not be allowed to form. If after a fair period of time no benefit results from this treatment, perchloride of iron (℥i ad. ℥i), or chloride of zinc (gr. xx.-xl. ad. ℥i) should be substituted as a local application. If the catarrh extend low in the pharynx, the effervescing chlorate of potash and the compound

eucalyptus lozenges often give great relief, and assisting in effecting a cure. Great advantage is also derived in many cases from injecting an alkaline wash through the patient's nostrils, or directing him to suck it up through his nose.

In these cases of post-nasal catarrh, the naso-pharyngeal douche, or the curved douche for use through the mouth will be found most efficacious. I am in the habit of using mild chlorinated soda washes, combined with salycilic acid and sulpho-carbolate of zinc. I find great benefit from the thorough swabbing of the naso-pharyngeal cavity with carbolic acid and glycerine, and chloride of zinc or perchloride of iron applications as recommended by Dr Mackenzie. These patients must be all taught to use the nasal douche. I have found great service follow from wearing nightly a plug of wool in the nostril smeared over with vaseline and iodoform (15 grs. ad. $\frac{3}{4}$), or the iodoform diluted with bismuth and starch may be used locally with an insufflator, and be blown on the pharynx. The patient should also be taught to use antiseptic and deodorant gargles while lying on his back, so as to thoroughly reach the seat of the affection.

In treating all such cases it should never be forgotten that constitutional treatment must accompany the local applications, as for instance, attention to diet, exercise, change of air, the ventilation of sleeping apartments. Frequently in syphilitic cases a course of the bichloride of mercury with preparations of bark, or the bityanide of mercury (gr. $\frac{1}{12}$) with quinine (gr. ij) in pill with gentian, will be of service. This should be alternated with a course of iodide of potassium and bark.

So in other cases much may be effected by the combination of iron and arsenic—

R	Ferri sulph. ex.	.	.	.	.	.	1½ gr.
	Acid arseniosi	.	.	.	.	.	$\frac{1}{48}$ „
	Quinæ sulph.	.	.	.	.	.	i „
	Ext. nucis vom.	.	.	.	.	.	$\frac{1}{4}$ „
	Ext. gent. q. s. fit pil.						

Taken three times in the day after meals.

With children, cod-liver oil and iron, the syrups of the hypophosphites, and preparations of lime, will be found useful.—[*Author.*]

Hypertrophy of the tonsils is mainly a disease of early life, being sometimes congenital, and in the great majority of cases becoming developed at or before the age of puberty. Statistics show a considerable preponderance as regards the male sex. The condition is occasionally a result of previous quinsy, or of one of the acute exanthems, where the throat has been severely involved. It may be due to syphilis, and certain local affections, such as granular pharynx and nasal polypus, appear sometimes to assist in giving rise to it, probably from irritation. Chronic enlargement of the tonsils, however, is most frequently one of the local manifestations of a strumous taint. Towards middle life the volume of the glands steadily decreases, so that it is extremely rare to meet with a case of this affection in a patient over forty years of age.

Both tonsils are usually enlarged, though not to an equal degree. They are often of the size of a chestnut, and sometimes much larger, meeting each other in the middle line, and quite concealing the back wall of the pharynx. The existence of the condition can in many cases be guessed from the mere aspect of the child, as

“with its open mouth, drooping eye-lids, dull expression, and thick voice, it enters the consulting-room.”

By the projection of the enlarged tonsils into the passage of the fauces, they, of course, hinder the respiratory process, and this is usually accompanied by difficulty in swallowing. Snoring during sleep is a characteristic sign in young children, and a sensation as of a foreign body constantly provoking the act of swallowing is often complained of. The voice is muffled, and has a thick, somewhat nasal twang, whilst the articulation is very indistinct.

Defective hearing, or even deafness, is often associated with enlarged tonsils, probably from irritative congestion, and chronic thickening of the mucous membrane lining the Eustachian tube. The chief cause, however, of interference with the hearing, is supposed to be due to pressure on the posterior lip of the Eustachian aperture by coincident hypertrophy of the so-called “pharyngeal tonsil.” (See last chapter.)

What renders hypertrophy of the tonsils a serious disease, is the constant mechanical interference with healthy respiration, and the consequent lowering of the vitality of the whole organism from imperfect oxygenation of the blood. Not only is the passage of air into the larynx from the posterior nares arrested by the diseased masses in many cases, but there is often some difficulty in breathing through the mouth, which has to be kept open. The other physiognomic peculiarities already mentioned are no doubt attributable to the persistent lack of due arterialisation of the brain and vital system generally. A characteristic deformity of the chest has been observed in connection

with enlarged tonsils, consisting in a circular depression of its walls at the junction of the lower and middle thirds, with an appearance of abnormal bulging at the upper part of the thorax. It appears probable that this depression, which corresponds with the attachment of the diaphragm to the ribs internally, is produced by the additional work thrown upon that muscle in consequence of the hindrance to free respiration. The soft bones of the young patient contract a permanent deformity through being constantly drawn inwards with disproportionate force. (See last chapter.)

Chronic hypertrophy of the tonsils renders the sufferers peculiarly liable to illness of all kinds, especially to diseases of the air-passages; and, at the same time, the feeble vitality of such patients makes them unable to resist any strain on the system. Malnutrition, moreover, may follow as a direct consequence of the difficulty of swallowing, caused by the enlarged glands; whilst the morbid discharges from the diseased mass, besides setting up dyspepsia by trickling into the stomach, may possibly still further vitiate the constitution. Derangements of the senses of taste and smell are frequently found in connection with long-standing enlargement of the tonsils.

Pathologically considered, the condition is that of hyperplasia, affecting all the constituent elements of the tonsil. There is usually thickening and hardening of the areolar stroma of the gland, the follicles are enlarged, and the lacunæ are dilated, and filled with thick curdy mucus, sometimes even with chalky nodules. There is also thickening of the capsule, and occasionally the neighbouring lymphatic glands are

enlarged. In some cases the tonsils present but little enlargement, but their surface is rough and, as it were, *honeycombed*, owing to the enlargement of the lacunæ. Tonsils in this condition are exceedingly liable to inflammation.

The recognition of enlarged tonsils generally presents no difficulty; but still it is necessary to be on one's guard against possible error. The glands may appear to be very much hypertrophied through being rotated forwards and towards the middle line, so as to present their inner surfaces anteriorly and appear near to each other, thus simulating great enlargement. To avoid error from this source it is well, in examining a patient's tonsils, to make him open his mouth widely, and take a deep breath, when the natural relations of the parts will be retained. On the other hand, tonsils which are in reality much enlarged may escape observation from being almost hidden behind the anterior pillars of the glands. A correct estimate of the volume of the organ can be obtained by palpation, the first finger of one hand being applied to the internal surface of the tonsil, and that of the other to the outside of the throat close behind the angle of the jaw.

Hypertrophy of the tonsils in children usually demands immediate treatment, the cases being very exceptional which tend to spontaneous cure, and the constitutional effects of the condition being usually, as already stated, of so grave a nature. An enlargement beginning in adult life is seldom anything more than a local inconvenience. It may, however, be more serious in a patient naturally delicate, especially if the gland be often attacked by acute inflammation.

The treatment of tonsillar hypertrophy may be divided into *local*, *constitutional*, and *operative*.

Local treatment, which consists in applying astringent remedies directly to the enlarged gland, is seldom of much efficacy in reducing its bulk, but such agents have a very beneficial effect upon the *honeycomb* tonsil. A solution of perchloride of iron (3i to 3ii ad 3i) may be applied once or twice daily with a brush, or finely powdered alum or tannin may be blown into the tonsil with an insufflator, and then rubbed well into the surface of the tonsil. Tincture of iodine painted over the enlarged structure has little or no effect, nor does solid nitrate of silver answer better, though both are often recommended. In real hypertrophy of the part, escharotics sometimes give good results. I have often found the London paste (Throat Hospital Pharmacopæia) so efficient in diminishing the size of enlarged tonsils as to preclude the necessity for a cutting operation. The powder should be mixed with a little water, and rubbed up to the consistence of thick cream, and applied to separate points of the diseased structure by means of the pharyngeal spatula. Immediately after the application, the patient should freely gargle his throat with cold water. This should be repeated at intervals of two or three days, and care should be taken not to apply the paste too freely. Its effects should be closely watched, lest extensive inflammation be set up by its use. Injections of dilute acetic acid (B. P.) into the parenchyma of the tonsil by means of a curved syringe is occasionally successful, but the process is painful. Tonsillar hypertrophy has also been reduced by electrolysis. With any of these local measures

should be combined constitutional treatment according to the particular indications of each case. For this purpose, fresh air, nutritious diet, with general tonics, or special remedies, such as iodide of potassium, cod-liver oil, and phosphate of iron, should be employed. The sulphurous springs of Bagnerès de Luchon are said to be very beneficial in such cases.

Operative treatment consists in the amputation of a portion of the hypertrophied organ by means either of the bistoury or of the tonsillotome. This is the only satisfactory method of dealing with tonsils so enlarged as to constitute a real inconvenience. I have always found my modification of Physick's tonsil-guillotine the most useful instrument for this purpose. The operation is attended but with a trifling degree of pain, and anæsthetics are quite unnecessary. In most cases the bleeding is slight, and soon ceases on the patient gargling his throat with cold water or sucking ice. If the hæmorrhage be severe, the patient should be directed to swallow slowly a small quantity of tannin held in suspension in water. The tannin is not intended to be dissolved, and a little gallic acid added to the water prevents solution taking place. The following formula will be found almost invariably successful:—

Tannic acid,	360 grains.
Gallic acid,	120 grains.
Water,	1 ounce.

Rub the acids to a fine powder and mix with the water.

Half a teaspoonful of the fluid very slowly swallowed is generally sufficient, and no more than is necessary should be administered. The patient, however, should

be instructed to have some of the medicament by him, so that he can at once use it in case the bleeding recurs.

The wound usually heals spontaneously in a week or ten days. The patient should be enjoined to remain indoors for a few days, and to avoid hot or irritating articles of diet. If, as sometimes happens, especially when the bleeding has been severe, the wound becomes covered with an unhealthy exudation, two or three light applications of solid nitrate of silver will suffice to change the ulcer to a healthy granulating surface.

CHAPTER XV.

AFFECTIONS OF THE TYMPANIC CAVITY—CATARRHAL INFLAMMATION, ACUTE AND CHRONIC.

WE have before briefly noticed the effects of closure of the Eustachian tube. One of the most frequent of these is catarrhal inflammation, acute or chronic, of the tympanic cavity. But it is necessary to separate into two distinct classes the suppurative and non-suppurative catarrhal attacks of the tympanum. We will first consider the non-suppurative form. This it is that generally leads up to that state known as "mucus in the tympanum." At the Medical Congress at Amsterdam in 1879, Dr Weber Liel, in a paper on "Intra-tympanic Injection" thus classified the causes of simple aural catarrh:—1. The symptoms of catarrh of the tympanum may depend upon extension of a simple catarrh from the Eustachian tube and the pharyngo-nasal cavity; then the latter only must be the object of treatment. 2. Or, secondly, the symptoms of the intra-tympanic catarrh are due not only to a catarrh of the tube, but to a collapse of the walls of the Eustachian canal, dependent on insufficient or paralysed action of the Eustachian tube muscles. 3. Symptoms of congestion and catarrh of the tympanic cavity may arise from alterations of the vaso-motor and trophic nerves and of the sympathetic supplying the tympanic cavity.

Dr. Tröltzsch classified aural catarrh under these heads: simple acute and simple chronic, sub-divided into dry and moist; acute suppurative catarrh, chronic suppurative aural catarrh, or chronic otitis media. On inquiry we find that all these abnormal states are but various degrees of inflammatory action occurring in the tympanic cavity or the passages. The inflammation may be acute, and not pass into the purulent form. The secretion is increased, but preserves its mucoid nature, mucus becomes accumulated in the tympanum, and if it is not allowed a means of exit by paracentesis of the membrane, this accumulation leads to a chronic catarrhal condition of the tympanum in which the bones and tympanic mucous membrane become affected.

This is *simple catarrh*, and seldom causes perforation. Should it occur in the acute form, there is the advent of the slight deafness (which is not rapid); the pain is slight, rather in many cases described as an "uncomfortable feeling" about the ear, some tinnitus, both accompanying a sore throat, or a slight attack of tonsillitis, with some nasal catarrh, perhaps some headache or accompanying neuralgia, and pain in coughing, sneezing, or swallowing, and at times in talking. On examining the drumhead, we may perceive little alteration from its normal condition; it may have lost its usual translucent appearance or appear slightly injected. It is in the naso-pharyngeal tract that we are most likely to find unhealthy conditions, coryza, swollen Schniederian membrane, swelling of the Eustachian tubes, enlarged tonsils, paresis of the velum palate, and general congestion of the pharyngeal mucous membrane.

In a review of Dr Weber Liel's work on "Progressive

Deafness" (1873), and from which I have before quoted,* Mr Laidlaw Purves gives an admirable summary of the views of the former author on the etiology of catarrh of the middle ear. Mr Purves says:—
1. There arises from the paralysis of the tensor veli collapse of the walls of the tube, and therefore hindrance of the proper continual ventilation of the tympanic cavity. 2. Allowing, from Weber Liel's newly given observations, that the tensor veli acts as an antagonist to the tensor tympani, when the elastic strain and contractility of the tensor veli is entirely or partially paralysed, not only collapse of the tube occurs, but an antagonistic contraction of the tensor tympani also; and so, the want of air in the tympanic cavity being added to the effect of the anomalous straining of the powerful system of active factors in the mechanism of the tympanic cavity, a high degree of nutritive and functional anomaly in the cavity and labyrinth must in time be occasioned.

Thus arise, according to Weber Liel, many cases of catarrh of the middle ear, from the hyperæmia *ex vacuo*, caused by the rarefaction of the intratympanic air, and the retardation of the tympanic and intratympanic circulation by the increased amount of strain and limited motion of the structures from the abnormally contracted tensor tympani. This double effect of air in the cavity and contraction of the tensor tympanic cause (1) an abnormally strong tension of the tympanic membrane, (2) an abnormally tight fixation of the chain of ossicles, and (3) an increase of the intralabyrinthic pressure, since

* Dr Weber Liel has recently sent me Mr Purves's paper ("Medical Record," Nov. 1874), with some few alterations and additions as seen in the text.

the stapes is pressed into the labyrinth by the ossicular chain. Thus the reception and conduction of the vibrations and the vibrating capability of the implicated portions are much prejudiced. As the functional expressions of these disturbances, arise subjective auditory sensations, and also frequently sensations of faintness.

At the beginning of the affection disturbances of hearing may very seldom be present, but they are not then noticed as deafness, but rather as acoustic hyperæsthesia for certain noises; and gradually thereafter defects in the capability of hearing, especially during mixed conversation, make their appearance, and again are followed by symptoms which are spoken of as accommodative disturbances; and now, when the other ear begins to suffer, the tinnitus gradually arises and increases: at first, for a long time, there is nothing save singing noises in one ear; always one ear is at first affected; the other one following in some time.

The collapse of the tube and the abnormal contraction of the tensor tympani continuing, there develop in time secondary changes in the sound-conveying apparatus, the hyperæmia of the tympanic cavity already present often increasing through the passage of catarrhal conditions from the pharynx to the now easily affected parts, and intratympanic exudations are easily produced by slight attacks of cold. The structures in the tympanic cavity being, on account of the defect of air in the cavity, approximated to each other, give these exudations points for adhesive attachments. A not necessary but very frequent consequence of the continual impressing and fast fixing of the stapes in the fenestra ovalis is a synostosis of the stapes, and other anomalies in the

joints of the ossicles; the local hyperæmia, which is especially marked in individuals of the gouty, rheumatic, and syphilitic diatheses, playing an important part in the production of such changes. In time the hyperæmia of the tympanic cavity lessens, the "stanungs-hyperæmie," leads to interstitial connective tissue growth, and, wasting of the vessels and trophic changes of different kinds are seen, atrophy of the tympanic membrane being common. It is comprehensible that in time changes in the circulation and nutrition of the labyrinth must also occur, not only on account of the continual and increasing pressure from the cavity, but on account of the difficulties under which the conducting apparatus must act.

It is a matter of observation that such patients at the beginning of a conversation often hear moderately well, but when the affected ear has been strained for an hour or so they complain of giddiness and increased tinnitus (spasmodic contraction of the tensor tympani), which symptoms can only be referred to an increased flow of blood to the labyrinth. Pulmonic and hepatic congestion increase (through the connection of the labyrinth with the arachnoidal space through the ductus cochlea (Weber Liel)), this trouble. The snapping noises heard in certain catarrhal states, Dr Weber Liel accounts for by the separation of the moist walls of the Eustachian tube in swallowing. The tensor veli is in a relaxed state. Intratubular electrification succeeds often in abolishing these noises.

Dr Weber Liel still adheres strongly to these views of his on the subject of aural catarrh. He does not regard pharyngeal catarrh as such a direct cause of aural

mischief as some would insist. In most of those cases of aural catarrh, he is of opinion that the accompanying difficulties in singing, swallowing, or in insufflating by Politzer's method are due rather to a collapse of the tube walls "through the abolition of the counter-straining force of the antagonistic muscles"—it is not a catarrhal state—it is rather paretic—"we can pass a bougie when the air douche will not act."

Frequently a patient presents himself with a history of a recent cold, or it may have been a throat attack, and this has been succeeded by a slight deafness and tinnitus generally of one ear. On testing the hearing with the tuning-fork, we find that it is heard loudest in the affected ear, and that there is no marked difference on closing the meatus of this ear; that is, the tuning-fork is not then heard louder. There may be conveyed a moist or gurgling sound with the otoscope. The membrane has perhaps lost its transparent look; it is either concave and of a dull or greyish white colour, or it is rather convex. We may at once suspect a recent acute catarrhal attack, passing into a chronic stage with an accumulation of mucus in the tympanum. But we more frequently, perhaps, meet chronic cases in which no treatment has been pursued, or, if any, some useless, empirical course of blistering and leeching, which has been energetically pushed, with a pleasing variation in the administration of remedies internally, while the tympanum has been all the time gradually filling with dry mucus, hardening and producing, it may be, irremediable changes. It is in such patients that we frequently find a dry external meatus—the wax is not secreted. As to the appearance of the membrane in

cases of accumulated mucus, I must confess that in my experience there is no one form characteristic of this condition. It may bulge forwards in any part, or appear as if the entire membrane was pushed outwards; or, on the other hand, it may appear abnormally concave, and this bulging or concavity may be accompanied by every variety of change in the position and shape of the membrane, and irregularity in the position of the malleus.

These alterations in the form of the membrane do not frequently bear any definite relationship to the degree of deafness or the tinnitus. The membrane may appear but slightly changed, and yet the deafness and tinnitus be extreme. There can be no doubt that nerve impairment frequently attends on the presence of mucus in the tympanum. Thus I have on many occasions noticed that severe mental shock, the occurrence of a fever with brain complications, have produced the nervous derangement, while an accompanying relaxed state of the throat has left imprisoned secretions in the tympanum. So, in other cases, a gouty or syphilitic taint has often been the source both of the nervous derangement and of the accumulated mucus.

It is often, indeed, very difficult to diagnose positively the presence of mucus in the tympanum, especially in old chronic cases complicated with other lesions, whether of the nerve, ossicles, or membrane. In such cases, for instance, the operation of paracentesis must be purely experimental, and may be, and often is, followed by negative results. Yet in many patients where we do not succeed in obtaining any proof of the accumulation by evacuating the mucus, still we have

the satisfaction of seeing them benefited by the treatment, and the hearing decidedly improved. Not long ago I had a patient who came to me extremely deaf, not hearing the watch when pressed to the ear, and whose conversational hearing power was very bad. There was an old syphilitic history. The tuning-fork was well heard, but closure of the meatus produced no difference, the membrane had a bulged appearance, and the sound with the otoscope was of a gurgling character. I determined to incise, and accordingly, after some previous syringing with warm iodide of potassium, punctured both membranes and kept the apertures free. I succeeded in getting a quantity of semi-transparent mucus of a brownish colour through both openings. This man, with his face averted, subsequently heard me conversing in a low tone across my study. I have just such another case attending me at the present moment, in which the previous warm syringing of iodide of potassium solution, through the tympanum, preparatory to puncture, has produced considerable benefit. Perforation of the membrane was followed by a marked and still further improvement.

The treatment of accumulated mucus must to a great extent depend on the duration of the affection. If recent, and that the accumulation has not gone to a great extent, we can do much by warm alkaline injections (two to five grains to the ounce) of carbonate of soda, iodide of potassium, common salt, chloride of ammonium, &c., into the tympanum; also by injection of sulphate of zinc (two to five grains to the ounce), or the passage of iodine vapour. Mr Keene of Westminster Hospital has devised a special syringe for

adapting to the catheter and inflator. He claims for this syringe that the fluid is not forced at once into the tympanum, but is introduced in the form of spray. Such means, combined with the free use of the air douche and the nasal syphon douche, or the sniffing up of tepid salt and water into the nostrils, often afford complete relief. For the systemic states accompanying the tympanic trouble, perchloride of iron, in combination with strychnia where there is general debility, is *the* most valuable combination. At times, in hysterical patients and delicate women, bromide of potassium, or bromide of ammonium with iron, or the salts of zinc, bromide and phosphide, I find most useful. For the tinnitus, the internal use of bromide of potassium and hydrobromic acid, hydrobromic ether and the nitrite of amyl may be tried. Iodide of potassium in gouty and syphilitic systems, and also bichloride of mercury in the latter, are of service. Thorough cleaning out of the Eustachian tube and tympanum, combined with such internal remedies as give tone to the system, at the same time that we keep the secretions regular (with Freidrichshall and Hunyadi Janos water), is the summary of the treatment of such accumulations in the tympanum.

Then the question of artificial perforation remains. I have elsewhere alluded to this operation and the mode of performing it. Whatever doubt may remain as to the propriety of this step as an experimental effort in obscure cases of deafness, combined at times with division of the tensor tympani, to afford relief, especially in troublesome tinnitus, none can exist as to its utility, where accumulated and imprisoned secretion is the

cause of the trouble, or in those acute cases, before referred to, which are so ambiguously grouped under the heading of "acute aural catarrh."

Most frequently the origin of both acute and chronic (non-suppurative) catarrh may be traced to some abnormal state of the Eustachian tube. I may best devote in this place some space to the consideration of such deviations from the healthy condition.

Eustachian Obstruction and Closure.—The study of the various diseases of the ear, which follow abnormal conditions of the Eustachian tube shows that the healthy or unhealthy state of this canal offers to us a clue to the causes of, by far the largest proportion of aural complaints.

The exciting causes of Eustachian closure may be simply cold "caught" in any way; exposure to draughts, damp, rheumatism, sea-bathing, exanthemata, heavy mental shocks, &c., are some of the most frequently assigned causes. During a cold, every one is familiar with the sense of stuffing in the ears, and perhaps muffling of sounds, or tinnitus which accompanies it. On examining the throat, we may find the mucus membrane swollen or turgid, there may be a granular state of the pharyngeal membrane, the follicles are enlarged, perhaps the uvula is relaxed, or the tonsils are hypertrophied. The faucial orifice of the Eustachian tube is likewise swollen; and in consequence there is temporary closure of the passage, and secretions are imprisoned in it. It is when this condition persists for a little time that we see the characteristic membrane of Eustachian closure. Little air enters the tube, and a partial vacuum is formed in the tympanum, this

results in an increased concavity of the membrane. Hinton described this form of membrane as characteristic of Eustachian deafness. "The malleus appears foreshortened, and the membrane has a tense stretched look, like a drawn curtain, often falling into similar folds. The colour varies, is generally white and dull, but sometimes, especially in the earlier stages, the congested mucous membrane of the tympanum shines through it." When inflation is resorted to, we hear the sound with the otoscope either not at all, or with great difficulty. Now, this simple swelling of the Eustachian tube, which at first may be periodical and remittent, may finally become chronic and permanent, beginning with a slight deafness, and perhaps a little ear-ache; it may or may not be a considerable time, dependant to a certain extent, whether the mischief appertains to one or both ears, before troublesome deafness, accompanied by tinnitus, occurs. Nothing in the whole range of medical practice is more astonishing than the extent to which persons permit aural mischief to proceed before they seek relief, the more so if only one ear be affected. Often it is the incessant noise in the ears that forces them to apply for relief and not the deafness. If the closure and obstruction lead to other results, say acute inflammation (suppurative catarrh) of the tympanum, and perforation of the membrane, as it frequently does, then they apply for relief of the pain and other symptoms which accompany it. When the Eustachian tube does pass into this chronically contracted or permanently closed state, the most serious results follow.

Slight catarrhal inflammation, which is the conse-

quence of the primary affection, leads to an accumulation of mucus. This mucus increases in quantity and is imprisoned. It may become hardened and form hard masses both in the tube and the cavity of the tympanum, about the chain of ossicles, and on the membrane. A chronically collapsed and closed Eustachian tube, leading to imprisonment of mucus and alterations in the position and structure of the membrana tympani, followed later on by permanent change in the shape and appearance of the latter with adhesions, ankylosis of the ossicles and hardening of the mucus, are the usual effects which ensue on a common cause, viz., a catarrhal state of the nasopharyngeal mucous tract.

I quote again from the paper by Mr Purves before referred to Dr Weber Liel's views of the causes which contribute to relaxation, insufficient action, and paralysis of the tubal muscles and velum palati. General weakly conditions from disease, parturition, excessive exertion, unhealthy conditions of life (nervous exhaustion, masturbation), will have disturbing influences on muscles already weak, and this is often the case with the muscular apparatus of the tube. He thinks that the muscles of the tube of the left side participate in the general more feeble development of that side, and thinks that the affection nearly always begins on the left side. Chronic catarrh of the mucous membrane covering the muscles appears to have often been the starting-point of defective functional ability of this group of muscles. In nervous individuals, in those much affected by grief or care, with different nervous lesions (*e.g.*, of the trigeminus), the innervation of this portion is very easily disturbed under disposing influ-

ences. Rheumatism, tubercle, typhus, diphtheritis, progressive muscular atrophy, chlorosis, and anæmia are all mentioned as causes.

I am fond of applying with the Turnbull's nasal forceps and cotton wool a solution of nitrate of silver (10-20 grains to the ounce) to the orifice of the Eustachian tube.

Dr Weber Liel lays special stress on the methodical practice of gymnastic exercises with the muscles of deglutition and respiration and of the Eustachian tube, while we combat the general debility by such means as a sea voyage, a tonic regimen and the internal administration of the salts of iron, strychnine, quinine, &c.

In the treatment of all conditions supervening on a closed or obstinate state of the Eustachian tube, the first matter is to secure its patency. The method of doing this I have already dwelt on. Catheterisation, assisted if necessary by ordinary or laminaria bougies (very fine), about half a line in diameter for the narrowest part of Eustachian (Hinton). If a laminaria bougie is used in addition to the catheter, it must not be left in longer than twenty minutes. The bougie is passed through the catheter, which is first passed, and the catheter is withdrawn before the bougie. I seldom now use any bougies. Various sizes of the latter may be introduced through the catheter, which then can be withdrawn with the bougie, and so we may prevent its being broken in the passage. Here I may refer to the only accident that can occur of any importance from the use of the Eustachian catheter. The careless or rough passage of the catheter, followed by too powerful an inflation, may lead to laceration of the mucous mem-

brane and emphysema of the cellular tissue of the pharynx, and parts about the larynx, or as proved by Voltolini to pneumathorax and consequent collapse of the lung. Such an accident can only, we fancy, result from the employment of unjustifiable force or the reckless use of the handbag in inflation. I have never had a case of a foreign body (except snuff) blocking up the tube. I rely in most cases of Eustachian closure, mainly on warm iodide of potassium or chloride of ammonia injection, and frequent use of Politzer's bag. The nasal douche of salt water, previously alluded to, is often of great benefit, and gargling with cold alum water lying in the horizontal position. But constantly we meet patients who cannot use the syphon douche. Then the simple sniffing up of a warm solution of salt is a capital substitute. I generally direct about an egg-spoonful to two wine-glasses of tepid water, used once daily. If suppurative catarrh leading to perforation occurs from closure of the Eustachian tube, we must be satisfied with the gentle washing out of the tympanum daily, with a warm solution of chloride of ammonium, while we attend to the inflammatory condition of the membrane by warm fomentations, gentle syringing with anodyne and alkaline washes, leeches, or vesication. Amongst the drawings in my "Atlas" is one typical of a class of membrane frequently found as the result of closure of the Eustachian tube, and accompanying this condition. The membrane has that characteristically thin appearance seen in complete collapse. On inflation, the lower portion of the membrane was blown bladder-like out. The upper part and malleus were bound by adhesion down to the inner wall of the tym-

panum. Hinton graphically describes this state under the head of "Collapse and Rigidity of the Membrane," and he notices the fact, illustrated in the above-mentioned case, that the hearing power is often good. He advises, when the membrane lies in contact with the tympanic wall, the application of the artificial membrane. Suction of the meatus, as recommended by him, will be found of service in these collapsed conditions of the Eustachian tube. This is best effected with the pneumatic speculum, through which we can at the same time see the extent of the adhesion. It is a good plan to give a patient a piece of tubing with a quill covered with india-rubber inserted in one end so as to fit the meatus air-tight, and instruct him to apply suction with the mouth through the other. This plan of suction and inflation practised by the patient himself may be followed up by the incision of the membrane, tenotomy, or, in rare instances (Hinton), an attempt may be made to restore the malleus to a normal position, as by doing so we free the stapes. This, however, is a step not to be lightly undertaken, as it requires the most delicate manipulation to cut round the adherent malleus or stapes, and raise them by the gentlest of pressure into a better position. Politzer's plan of "air-tight closure" of the meatus when the membrane has been well inflated, may be found useful in these cases of collapsed membrane. A piece of cotton wool is rolled into a ball with some cord or softened wax, and after a powerful inflation of the membrane, the meatus is plugged with the ball. This the patient can do himself, wearing the ball at night, and periodically omitting it.

Cretaceous Deposits on the Membrane.—Often associ-

ated with catarrhal conditions of the tympanum we find these deposits are easily recognised. They appear as white layers of chalky substance on the membrane, which is generally also altered in shape perhaps adherent to the tympanum. They may exist without much disturbance of hearing, and frequently are to be found in one ear only. A lad of 18, whose hearing in the left ear was normal, consulted me for obstinate deafness in the right ear. The two pockets were covered with irregular shaped white masses of a chalky substance. The tuning-fork was heard less loud in this ear, and inflation of the membrane was attended with a dry sound. I did not interfere. A drawing of this case, and others of the same nature, I have included amongst those I have selected for the "Atlas." An officer consulted me for constant tinnitus in the right ear. The deafness had lasted for ten years; it was rather worse of late; he had been twelve years in India; the tinnitus commenced after his return home, and the deafness grew worse. There never had been pain; there was no family history of deafness. The watch was not heard on contact. The membrane had a calcareous mass in the superior pocket, and on inflation there was a dry and grating sound. The tuning-fork was heard only in the left ear, whether placed on the head or the teeth. He suffered from giddiness at times, and tendency to fall. When the secretions were irregular, or that he was "bilious," the tinnitus, he said, became much worse. Nothing relieved him. Hydrobromic acid and bromide of potassium cured the giddiness, but the tinnitus yielded to no treatment. Hinton, in his remarks on the climate of India, notices the susceptibility of residents of that

country to the influence of quinine. In these persons, he says, "loss of hearing without visible affection of the tympanum is very frequent." So also he notices the tinnitus, which at times gets worse on return to England, as in the above case (the skin not acting), and remarks that children born in India, "who have lived there during their first years, seem subject to become deaf with no visible cause as they approach the age of puberty." I have myself been consulted by several officers who have returned from India with incurable deafness and tinnitus. In nearly all the cases there were evidences of old catarrh in the tympanum, and changes in the membrané and ossicles.

Intra-tympanic injections, says Mr Lennox Brown ("Specialist," January 1881), are useless on anatomical and physiological grounds. He bases his objections principally on these grounds: the position of the Eustachian tube being above the level of the floor of the tympanum, the mastoid opening, and hence the tendency for fluids to pass equally into the mastoid cells as out of the Eustachian tube; the tendency of such injections to set up middle and internal ear inflammation; the absurdities of looking for remedial results in the tympanic (*air*) cavity from the injection of weak alkaline solutions; the experiences of Wreden, Purves, Bonnafont, Burnet, and others, as to the inutilty and danger of middle ear injections of fluid. He quotes at length the views of Wreden on this subject. Certainly any one who read the indictment of this distinguished aurist against fluid medication of the tympanic cavities, would, if he had nothing else to guide him, never again attempt any injection, no matter

how weak, into the tympanum. Almost every conceivable mischief is ascribed to their use. "Suppuration always results if fluids enter the tympanum." Rupture of the membrane, luxation of the ossicles, vertigo, &c., are the consequences of the forcible injection of any fluid into the tympanum. This is a startling category of accusation to hear of a step one has been taking for years with impunity. I see some five hundred fresh aural patients yearly. I have been engaged constantly at aural work for the past thirteen years. I can only recall to mind a few cases in which the use of fluid injection was followed by any unpleasant consequences—some otitis, but this subsided without any serious consequences. Mr Lennox Brown does not think that such injections have ever reached the tympanum. All I can say is that a vast number of mine must have, and I am as certain on this point as such excellent aurists, as he quotes, who are in favour of intra-tympanic medication, viz., Messrs Dalby, Field, Woakes, and Weber Liel. Of the value of chloride of ammonia, iodide of potassium, carbonate of soda, injected in weak *warm* solutions (gr. iv. ad $\bar{3}$ i) into the Eustachian tube. Whether they reach the tympanum or not, and merely act through their influence on the Eustachian tube, I have not the slightest doubt. I have before figured Dr Weber Liel's Koniontron, and all those who witnessed his demonstration with this instrument in Cork in 1879 agreed as to its utility and safety. I use a small two-drachm bag that fits accurately into the catheter. Mr Lennox Brown says, in cases of unabsorbed mucus, "which resists Politzer, Valsalvan, or cathetric inflation, with simple air, or

which cannot be dispelled by passage of medicated vapours of steam, iodine, or ammonia—a therapeutic measure to which I attach the highest value—a small perforation of the membrane may be made in the postero-inferior quadrant and a current of air passed, followed, if necessary, by a weak solution of carbonate of soda not more than ten grains to the ounce. If the mucus is inspissated, and is not dissolved by this means, I employ suction. For this purpose the Siegel's tube as generally constructed, with suction by the mouth of the operator, is frequently not of sufficient strength, while the pneumatic tractor of Woakes has the serious drawback that the surgeon, not seeing the membrane on which he is acting, cannot regulate the force of the exhausting process. I have therefore had constructed an instrument which consists of an exhausting bag easily controlling the amount of extractive force, attached by a tube to a Siegel speculum. It is quite possible that such a modification has been already employed. If so, I am unaware of it. In the case of adhesions, this instrument is also of the greatest value in drawing out the membrane and in breaking them down.”*

As to define with any degree of accuracy the exact case that will be benefited by intra-tympanic injections, further than in a general way to hope from the symptoms presented that good may result, I do not think it possible. I quite agree in the opinion of Mr Dalby, quoted by Mr Lennox Brown:—“I do not believe any one can tell, on the first examination of such a case as

* On the Treatment of Non-suppurative Hypertrophic Catarrh of the Middle Ear, with especial reference to the Employment of Intra-Tympanic Injections. By LENNOX BROWNE, F.R.C.S. Edin.—*Specialist*, 1881.

I am describing, whether the patient will receive much or any benefit from treatment; so we are forced to act almost in the dark, and be guided by what has been the result of treatment in similar cases. . . . If you were to take all the cases I have treated for the last three or four years, they would display the greatest discrepancy as to results. . . . Even in the most successful cases of this kind, when the catarrh dates back for some years, and the secretion in the tympanum has become inspissated, the recovery is, as far as I know, never so complete that the patients regain perfect hearing."

Acute and Chronic Suppurative Catarrh.—Very different is this affection from the non-suppurative variety; we have it typically represented in the attack which accompanies or follows scarlatina or typhus fever. Here we have as a rule severe constitutional symptoms, violent pain, tinnitus, deafness, attended at times by vertigo, and discharge of pus from the meatus. Perforation of the membrane occurs in periods varying according to the severity of the attack. It is in the neglect of the warning afforded by the aural mischief, the attention of the medical man being diverted by secondary brain complications, such as convulsions in young children, when in reality the trouble is purely aural, that the surgeon is so apt to commit an error. Irreparable deafness—perhaps mutism—is the consequence. The acute attack may end in a chronic inflammatory state of the tympanic cavity and the accumulation of pus in it; or it may terminate in a spontaneous perforation, the drum-head rupturing and giving vent to the imprisoned secretion; or, again, the pus may find its way into the mastoid cells, giving rise

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to abscess in these, or perchance the mischief may extend to the brain itself, giving rise to inflammation and meningitis, and worse result of all, cerebral or cerebellar abscess. If we examine the membrana tympani before such perforation takes place we find it either deep red or generally of a bright pink colour, it has a swollen appearance from the gradual obliteration of the pockets and malleus, which goes on until the membrane has lost completely its normal character. Such a membrane is represented in the "Atlas," of a little girl who died of brain complications a few days after the drawing was made. Often, after perforation has occurred, pain may abate totally or partially, or intense pain may continue with a pulsating perforation. I have had last year one such case, where, after acute suppurative inflammation terminating in perforation, notwithstanding everything that could be done, the brain was attacked and death ensued within ten days from convulsions. The little girl above alluded to was a very rapid case, death occurring in some few days from the onset of the symptoms, there being here no perforation and the parents refusing interference. She died from the supervention of convulsions. This was just one of those cases where close attention to the ear and incision of the membrane might have saved life. In children especially, this brain mischief is apt to creep on unperceived. The rapidity with which cerebral complications sometimes make their appearance in the midst of perfect health, in cases of long-standing ear disease, should always be borne in mind. Increase of pain and deafness with constitutional symptoms, such as rigors, high temperature, furred tongue, rapid pulse, mark the

outset of the mischief, and as the discharge from the ear may have ceased, attention is diverted from this organ. But often, notwithstanding every effort, the patient rapidly succumbs. The pain increases in the ear, and radiates over the entire head. The pulse falls, the bowel is costive; obstinate vomiting may ensue. The mind generally remains clear, but finally the patient sinks comatose or convulsed.

Causes and Treatment.—There can be no doubt that the exanthemata furnish most frequently the starting-point of the disease. Cold, exposure to draughts, blows on the ear, that vile habit of boxing the ear,—all may give rise to the mischief. We shall afterwards refer to the effects of cold bathing in producing inflammatory catarrh of the tympanum. Dr Burnell draws attention to the importance of remembering the close relation of the molar teeth to the tympanum, and the possibility of an error in diagnosis being made through mistaking the pain of decayed teeth for ear-ache. “Whenever,” he says, “we find ear-ache without sufficient objective symptoms to account for its cause, it is never amiss to inquire after the teeth.” The treatment consists in warm anodyne fomentations, applied with care, if the pain be very severe, both externally or by gentle washing out of the meatus. Subcutaneous injection of morphia, the free application of leeches, incision of the membrane if we suspect pent-up secretion, and the same over the mastoid process, or the use of the trephine if there be any bulging of the inflamed part, from which we may suspect the presence of purulent matter in the mastoid cells. On two occasions I have seen life directly saved by a free incision made down to the mastoid process,

this incision being followed by the escape of pus and dead bone. At the same time the constitutional symptoms should be attended to, the bowels carefully relieved, a saline given internally, while a combination of bromide of potassium and hydrate of chloral, with the local application of the vapour of bromide of ethyl, may relieve the pain.

Chronic Suppurative Catarrh of the Middle Ear may follow as a result of the acute form. Scarlatina and diphtheria are the two acute diseases that most frequently bring about this condition. In the early part of this work I dwelt on the absurd popular prejudice regarding discharges from the ear and the dislike of parents to interfere with them. This often leads to neglect at home, and the late period of the affection at which the physician is consulted. The otorrhoeal discharge fills the meatus, blocks up the canal, chokes the tympanum, destroys the ossicles, having long since escaped through the perforated membrane, and yet the patient, often a child, is not brought for relief until the unpleasant deafness renders it inconvenient for teacher or parent. Too frequently has the disease made inroads into the labyrinth or attacked the nerve. The tympanic cavity has cakes of old hardened masses of epithelium and pus, with aspergillus that has developed in the decaying debris. These are of all cases the most insidiously dangerous. Perhaps the discharge has ceased to flow from the meatus in consequence of the complete blocking up of the tympanum, or the closure of a perforation or the collection of cerumen in the external auditory canal. Meantime mischief has been advancing in the petrous portion of the temporal and

adjacent surface of the membranes or brain. Any form of brain trouble may be the consequence.

A few years since I lost a valued friend with just such a train of symptoms as those above mentioned. He had been a patient of Mr Toynbee's, and had occasional discharge from the ear, and a large perforation which was never properly healed. This discharge broke out occasionally, and caused him great annoyance. Suddenly, before the fatal attack, it ceased. He was seized with violent pain, and he died in a few days comatose.

I am aware of five cases in which death by pyæmia from implication of the lateral sinus occurred. Quite recently a curious case came under my care in the Cork Fever Hospital. The patient, a woman, aged thirty-four years, was admitted as suffering from fever. The unusual head symptoms caused me to suspect the accuracy of the diagnosis. There was no delirium, though the woman kept constantly rolling her head from side to side on the pillow, and complaining bitterly of violent pain in the occipital region, crying out occasionally with a shrill shriek, "My poor head; my poor head!" She had peculiar seizures of the muscles of the right side of the face, closure of the eyelids, dragging of the mouth to the right side. Later on there were jerking of the right extremities. On inquiry I found there was a history of an old catarrh of the left ear and discharge. The discharge had ceased of late, and the pain in the ear had been severe for three weeks before admission. She died on the seventh day after admission to hospital. As I suspected, we found at the autopsy an abscess involving the right lateral hemisphere of the cerebellum, the peduncle, and crus; the

pus was fetid. There was no necrosis of the posterior surface of the petrous surface of the temporal bone, which was quite healthy. The tympanum was packed with dried pus; the labyrinth was full of pus; the membrana tympani was present, with a perforation about the size of the head of a pin.

Perforation of the Drum-head.—In chronic suppurative catarrh, we recognise that frequent source of perforation which is so commonly presented to us in hospital practice. The patient complains of deafness and discharge; there may or may not have been attendant pain. When we inquire into the cause, especially in children, we find that it is not easily ascertained. It may be attributed to cold or some feverish attack, or have supervened on some one of the exanthemata. Its origin may have been a foreign body or an injury. On examining the ear there is often a quantity of yellowish discharge concealing the membrane from view; this is chiefly pus mixed with epithelium. Perhaps there are collections of fungus in the depressions on the walls of the meatus, on the membrane, or in the tympanum. After a careful cleansing, we see the membrane in varying degrees of thickness and shades of colour, most frequently perforated. These perforations are often large, and not uncommonly polypoid growths detected growing from the tympanum through the perforation, or projecting from it. On examining the throat in these cases we may find an explanation of the ear trouble.

Catarrhal states of the nasal and naso-pharyngeal mucous membranes, and follicular enlarged tonsils, are conditions that accompany Eustachian obstruction or

closure. A perforation, unless it present the form of a mere rent in the membrane, or a minute pin-hole, is easily seen, and if not seen, is discovered by means of the otoscope. A source of error to beginners is the bright bubble of air and liquid which sometimes obscures the orifice. On throwing a good light on the membrane, and desiring the patient to close the nose and blow, the air will often be seen to bubble out through the aperture in the membrane. Sometimes these acute perforations pulsate, more particularly if this is due to the arterial throb. This pulsation may puzzle one not accustomed to examine such perforations. As to the character of the perforation, this may vary in size from a small pin-hole or chink to a large ragged opening. One or all the bones may be destroyed or attached by adhesions to the tympanic walls. A mere rim of membrane may be all that is left, or even this may be absent.

In the aural "Atlas" are some plates exhibiting the various forms in which perforation is met with. It is remarkable the large number of patients who have extensive perforations yet retain remarkably good hearing power. The greater the number of cases we treat, the more are we astonished at the percentage of patients whose hearing varies, say from 5-50 to 10-50 with the watch test, and whose conversational power is excellent. As noticed by Politzer, Wilde, and others, this hearing power does not appear to depend so much on the size of the perforation as the part implicated. It, of course, is more particularly influenced by any abnormality of the stapes, directly through adhesions, ankylosis, &c., or indirectly through the direction of the perforation

(Politzer), and the transmission of the sound-waves to this bone. This is to be remembered in the application of artificial drums, the good effected being not so much attributable to closure of the opening by the disc or wool, as to properly-applied pressure on the stapes. Hence it may be only after two or three trials that we get the desired result, in applying a membrane for the first time.

A very large proportion of those who apply for relief for perforation of the membrane are children. Aural catarrh, acute or chronic, is often shamefully neglected in children; the younger the child, and therefore the less competent to make its complaint known, the greater the probability of neglect. Aural mischief is, in a very young child, often masked by symptoms that direct attention to other parts, the brain, stomach, or the teeth. Discharge from the ear is long neglected, and the ignorance of its cause or the results of its continuance induce many to fancy that to arrest it is a mistake. Therefore it is that in children, where there are obscure head-symptoms with feverishness and restlessness, the surgeon should always examine the ear. The carrying of the hand to the ear is often the only indication of any local mischief. Otorrhœa continues often for a long time in children with but little effect on the hearing, and no pain. When the ear is seen for the first time there is frequently perforation of the membrane, a granular state of it, or polypus. The present neglect of aural complaints in young children is a fact that cannot be too strongly animadverted on. Too often it unfortunately happens that the surgeon is asked for advice only when irremediable and fatal brain complications have

arisen. If this be on the part of friends culpable, how much more so in the case of the medical adviser, who, through carelessness, has permitted these warnings to pass unheeded, which might, if noticed in time, save life.

I rely more on systematic attention and cleanliness in all otorrhœal troubles than on all other measures combined. I think it of great advantage to wash out the tympanum occasionally through the perforation in the manner already described. This is easily done, and cleanses the Eustachian tube also of any secretions that may have passed or accumulated there. I have never, though it is a constant practice of mine, had any worse result from it than a temporary giddiness.

To successfully treat any aural case, the surgeon must always remember the cycle of causes which set in motion the actual train of symptoms from which a patient suffers. The disease may have its origin in the throat, nose, or pass to the Eustachian tube, and thence to the tympanum with its ossicles, involving the membrane, and lastly the external meatus; or the reverse of this order may mark the course of the disease. This must always be remembered in perforation. All through on treating a case we must not merely direct our efforts towards healing the membrane, but we must also attend to all the passages, as, for example, any relaxed or congested state of the mucous membrane of the pharynx, enlarged tonsils, and to the naso-pharyngeal mucous membrane. If the throat be engaged, astringent gargles, lozenges of kino, guaiacum, chlorate of potash, catechu, eucalyptus and compound eucalyptus, plain or effervescent (Throat Hospital Pharmacopœia) douches, or sprays with carbolic acid, or permanganate of potash

solutions, &c., are useful. Touching the pharynx and Eustachian tube with solutions of nitrate of silver, chloride of zinc, or perchloride of iron, insufflation of finely-powdered guaiacum, or bismuth, tannic acid and starch, through the nares or on the pharynx; these are a few out of the many means which may be resorted to. If the tonsils are much enlarged they should be removed. Often as I have removed the tonsils, I have never had any troublesome bleeding with this instrument, none which a little alum gargling, or the use of perchloride of iron did not immediately restrain. The suction of ice before and after removal is a precaution I always adopt. If the Eustachian tube is closed or obstructed it must be attended to, catheterised, and washed out with warm alkaline solutions. So also the tympanum, if there be any accumulated secretions; Politzer's air douche is here indispensable. But when we come to deal with the perforation itself, the first essential is perfect cleanliness, by washing out all discharge from the tympanum and meatus. In syringing through the tympanum and Eustachian tube I select generally a chloride of zinc solution, or chloride of ammonia or sulpho-carbolate of zinc (gr. ij. to gr. iv. to the ounce), with a little glycerine or carbolic acid. I always first pass a stream of water through, and then the astringent or disinfectant solution. In fact, in all syringing of the ear, whether by the patient or the surgeon, warm water should first be used, so as to clear out all old discharge before employing a medicated solution. The healing of the perforation, which is generally a tedious process, is best effected by repeated topical applications of various stimulating and astringent powders and solutions. Tale

powder, boracic acid (impalpable powder), tannic acid, salicylic acid, nitrate of silver, chloride of zinc, sulphate of zinc, alcohol and glycerine, carbolic acid and glycerine are some of those most frequently used with success. Having cleansed out the meatus and perforation well, the latter should be then thoroughly dried with cotton wool rolled on the aural probe, and then with this same probe the nitrate of silver or other solution carried well down to the perforation, and its margin touched. I always use the air douche of Politzer a few times after the employment of any of these agents. If the talc powder be used it must be very gently blown with a fine tube, and quite on to the surface of the membrane, and care must be taken that it is washed out every third day before it is again applied.

Dr Robert Sinclair of Dundee, in a paper on Chronic Suppuration he was kind enough to send to me, says:—"Iodoform was recommended first, I think, by Dr de Rossett, and has been lately extolled by Czarda. It is applied in the same way as salicylic and boracic acid. Scarcely anything in my experience of aural therapeutics has given me so much satisfaction as this remedy. The rapidity with which both fetor and pus in very old-standing cases disappear under its use is truly astonishing. In the most inveterate cases I have seldom found it necessary to make the application oftener than twice a week. While I do not claim for it infallibility, or anything approaching such a position, I believe iodoform, properly applied, will lighten the labour and anxiety of those who undertake the treatment of tympanic suppurations more than anything else which has hitherto been advocated. Its objection-

able odour may be very largely mitigated by trituration with a fourth part of tannic acid." In this opinion I largely agree. I now commonly use iodoform for cleansing the meatus in this form—

R	Iodoform	.	.	.	.	.	.	gr. xv
	Balsam tolu	.	.	.	.	.	.	„ xv
	Vaseline	.	.	.	.	.	.	3 ij-iv

applied with a camel's hair pencil, or a little of this is smeared on a piece of cotton wool and inserted into the meatus after it has been washed out at night, the last thing, with a sulpho-carbolate of zinc and chloride of ammonia wash. This is repeated in the morning, and the lotion again used. The wool is worn at night in those cases where there is but slight discharge.

I rely chiefly in all these cases on nitrate of silver (ten to twenty grains to the ounce). I find it, after various trials, the most efficacious remedy for healing perforations. Alcohol and glycerine, equal parts of each, I find also most useful for cleansing and hardening the membrane. I know no better lotion for the patient's own use than that of sulpho-carbolate of zinc and glycerine with carbolic acid. However, these remedies, and others such as alum and chloride of ammonia (I think it may be taken as a general rule that the most convenient strength of these various astrigent washes should be about five grains to the ounce), must be alternated and varied in the treatment of perforation, the secret of treating it successfully being constant attention and cleanliness on the part of the patient, combined with the application, almost daily by the surgeon himself, of the more powerful remedies.

In the acute stages preceding the perforation, every

means should be adopted to arrest the force of the inflammation, and to relieve pain; such as leeches, warm fomentations (never poultices), gentle warm washings-out of the meatus, attention to the throat, and, I am old-fashioned enough to recommend in many cases, vesication over the mastoid. When discharge does accumulate, it should be gently and carefully removed. If paracentesis is indicated the operation should be performed without delay.

With reference to the application of artificial membranes, I have previously described the different forms of these, and the best mode of their application. I seldom, especially in the humbler classes lately, resort to the membrane; I more frequently use the plain cotton wool. In some instances there is marked improvement, but I must say that in my experience, in a large percentage of perforation cases, that improvement is not sufficient to compensate for the inconvenience and slight risk that attends the use of the artificial membrane. This is particularly so in the poorer classes of society, where neglect of the artificial membrane is often found to be followed by bad results. I prefer in such persons to get the drum cavity and perforation into as healthy a state as possible, enforcing on the patients a periodical visit, and unless they are very intelligent, I do not trust them with an artificial membrane. This I give as my experience and practice, but every one can try the artificial membrane for himself, adopting such precautions as I have already laid down. The feelings of his patient, and the success of the experiment, are the best tests which he can have of its utility in any individual case.

Mastoid Inflammation and Abscess.—In catarrhal states of the meatus and tympanum the inflammation may spread to the mastoid cells and to the brain. The cerebrum and cerebellum may be attacked, more frequently the latter, if the case be that of an adult. There are many diseases that give rise to inflammation and abscess of the mastoid process. The exanthemata, injury, abscesses in the meatus, catarrh in the tympanum, polypi, scrofulous inflammation, all may, both in children and adults, lead to abscess in the mastoid or mastoid periostitis. The periostitis which accompanies these catarrhal states of the meatus, and which at times occurs independently of them, is marked by characteristic symptoms. There are frequently severe constitutional accompaniments, such as rigor, rapid coating of the tongue, quick pulse, increase of temperature, with severe pain. The post-auricular and supra-auricular regions become red and swollen. The rapidity with which the swelling occurs is often alarming. In a case I had of severe furunculous inflammation in the meatus, the entire side of the face and neck became swollen in forty-eight hours. The swelling has then an erysipela-tous look. I have never yet seen a case of mastoid periostitis or abscess where the meatus and tympanum have not been involved. The sterno-mastoid has only been implicated in one case. Turnbull notices that this implication of the sterno-mastoid is not probable when the inflammation is intense. Here we are more likely to have caries and post-aural opening. If the inflammation runs its course, it may cause suppuration, and the pus will escape either by the external meatus or through the mastoid process. Remembering the

anatomy of the bony parts, it must be a matter for surprise that the mastoid cells escape as frequently as they do, when the tympanum is affected. Still there can be little doubt that the spreading of the inflammation does frequently occur, and often is not suspected. Purulent or hyperplastic formations may occur in the mastoid cells, especially in children, and no external evidence exists of this. It is surprising how often in children, especially of the poorer classes, extensive bone changes may go on in the mastoid, leading to softening, necrosis, and caries, with but little indication of the danger, and consequently a degree of excusable neglect on the part of the parents. In a short paper on Hyperostosis of the Mastoid Process, by Dr Green of Boston, and published in the "Proceedings of the Otological Society of New York" (1877), the author divides the results of periostitis in the interior of the mastoid cells thus:—(1) *Formation of pus and resulting abscess*; (2) *Extension of the inflammation by the minute vessels in the osseous foramina to the external surface of the mastoid*; (3) *Otitis*—this latter being purulent or hyperplastic—purulent, leading to perforation, with consequent absorption of the entire osseous structure or of the calcareous particles alone, or, it may be, to complete necrosis or caries; hyperplastic, causing new periosteal bony formation, and resulting hyperostosis, and perhaps finally obliteration of the entire mastoid cavities by new bone. He illustrates the advantage in these cases of perforating the mastoid process, when accompanying brain symptoms prove the extension of the inflammation to the brain. Mr Hinton, in referring to this subject, says "the most scrupulous care should

be given to detect any symptoms of the presence of matter pent up under the periosteum. This is generally found in one of two places—either over the mastoid process externally, or within the meatus at the posterior and upper wall. Any redness or swelling, with tenderness of these parts, should prompt immediate action.” He points out that free incision of the posterior and upper wall of the meatus will often give great relief. In using the trephine, Mr Hinton says—“The best point to select is a spot level with the upper border of the meatus, and about half an inch beyond it; the perforator may be allowed to penetrate three-quarters of an inch.”* “It is,” he says, “of the utmost importance not to delay too long, and since the ether spray will generally suffice to deaden the pain, incision of the mastoid may be had recourse to promptly in every such doubtful case. I may repeat that I have never regretted making the incision, and scarcely ever decided against making it without regretting that I did not.” I thus prominently draw attention to this opinion, as I am aware that this is a step which is regarded with fear and a good deal of prejudice by those who are not familiar with the harmlessness of the operation, and the good results which frequently follow. On a few occasions I have in vain urged the propriety of making an experimental perforation of the mastoid process by the trephine when urgent brain complications were present, and the fear of the operation and its direct results prevented this step being taken. In two instances I

* Burnett gives the point of choice for perforation about a quarter of an inch behind the external auditory meatus, a little below the level of the upper wall of the canal.

can only regret that it was not performed, as death from brain trouble ensued, and the refusal of an autopsy prevented my ascertaining the cause of the fatal termination of the case. Burnett thus eloquently refers to such cases: "And yet men have been allowed to die with no better effort to their rescue than a poultice bound over the bony cavity in which lay the cause of their dissolution." In several instances, in adults, free incision over the mastoid, when there were signs of periostitis, has been followed by the happiest results—complete subsidence of the pain and inflammation, and in a case quite recently in which the most alarming symptoms—delirium, high fever, vomiting, &c.—were present, this step gave almost immediate relief, the rapid subsidence of the swelling in less than twenty-four hours after the free evacuation of the concealed pus eliciting exclamations of surprise from the students present, who had seen the patient on the previous day. In children, incision down to and through the bone is the thing indicated when there are evidences of extensive periostitis or purulent formations.

To illustrate how nature demonstrates the course of action indicated in these cases, I may cite the following instances of escape of bone through the external meatus, with relief of brain symptoms:—

In 1875 a child, aged four years, was brought to me with the following history. He had been quite healthy up to a few months since, when pain in the ear and discharge began. Subsequently an abscess formed over the mastoid process. The child had two or three attacks of convulsions. On examining the ear, I found the post-auricular surface soft and swollen, the meatus full of

purulent and foul-smelling discharge. I cleaned the canal well out, and was surprised to find the meatus filled with a piece of loose and dead bone. This I removed, incised freely the mastoid process, kept the incision plugged with iodised wool, and cleansed with carbolic lotion daily, washing out the meatus with the same. The child made a good recovery, but with loss of hearing.

In April last a young lady consulted me. The right mastoid process was completely absent, a large hollow existing. This had occurred when she was a child, and was the result of mastoid abscess, yet she had fair hearing power in the corresponding ear.

Last year a child, aged eighteen months, was brought to the hospital with a large aperture in either mastoid process. I freely incised the bone at either side, and almost the entire of the right mastoid process came away at the time, being removed easily with the forceps. Some time afterwards she came in my absence from home, and the other mastoid process had softened, and now was removed. The child became quite healthy. I syringed freely the external meatus with a disinfectant solution, such as chloride of zinc, Condyl's or carbolic acid, the fluid running out through the aperture in the mastoid. The parts have all now completely healed, and the child was recently brought by the mother to consult me about the hearing, which is lost.

Early this year a pale, anæmic-looking child, aged twelve months, was brought to the hospital with ptosis of the right eyelid, dilated pupil of the same eye, and the vision apparently lost. There was a considerable swelling of the entire left aural region. The mastoid

was very much inflamed, soft, red, and swollen; the auricle was projecting, this projection or displacement of the auricle being a pretty constant symptom in such cases. Altogether the child had a most peculiar appearance. There issued from the meatus a foul and long-neglected discharge. The skin behind the auricle was perforated in two or three places, and the bone was evidently dead underneath. The ear of the patient is represented in the "Atlas." I determined to make a free incision into the mastoid, which I did, and though, at the time, there was very formidable venous hæmorrhage, this was readily controlled with a plug and compress. The ear was daily washed out with chloride of zinc injection, and the mastoid dressed with carbolised wool saturated with chloride of zinc solution. Under this treatment the child did well, but the ptosis and strabismus remained. With the ophthalmoscope there was but little evidence of any abnormalities, the only thing apparent being a hyperæmic state of the papilla. Lately this child came to the hospital when I was absent on my holiday trip, and a long piece of the mastoid process came away, the wound being treated as before.

Volkman's fine spoon has been used successfully by Schwartz, Hartmann,* and others.

"An incision is to be made at the insertion of the auricle and in such a way that the middle of the incision lies just below the level of the opening of the external auditory meatus. If a fistula is present the

* "On the Formation of Sequestra in the Mastoid Process of the Child," by Dr Arthur Hartmann of Berlin. Translated by Dr James A. Spalding; *Arch. Otolology*, vol. viii. No. 1. New York, 1879.

incision either passes through the fistulous opening, or is to be united with it by a diagonal incision. In making the incision through the soft parts we must take care not to cut forward, since the surface of the mastoid process passes over into the posterior wall of the auditory meatus, without any sharply defined boundaries, and by passing forward we run the risk of only loosening the posterior wall of the external auditory meatus, and from here reaching the membrana tympani. This rule seems of importance, and should be especially observed where the soft parts are greatly infiltrated. The incision should not be too small, but fully 2 to 3 cm. in length. The edges of the wound should be held apart with sharp hooks, so that after the bleeding has ceased the field of operation can be thoroughly examined."

"In all the cases in which I have operated, either a fistula was already present or after the soft parts were cut through there was an opening in the bone which could be enlarged with the sharp spoon. In one case only did I have to employ the chisel in order to enlarge the small opening. The granulations lying in front are to be removed with the sharp spoon. If the antrum is opened and laid bare in this way it can be examined most carefully with the probe or with the tip of the finger introduced. If loosened sequestra are present they can be seized with pincers or forceps and extracted, or as proves most suitable, may be pried out with the spoon. The sharp spoon also offers the best services in removing the bone that has become softened by caries. The precautionary measure suggested by Schede, to use the sharp spoon only when the bone

is found to be softened to a certain degree, is not to be neglected."

"In my operations I have followed the maxim of confining myself in the removal of the morbid parts to what was most needed—*i.e.*, chiefly the removal of the granulations and the extraction of such sequestra as were fully loosened and could easily be reached. It seems then necessary in the after treatment to keep the wound open by a thick drainage tube, so that in the subsequent days we may have a full view into the depths of the wound, from which now the sequestra, gradually loosening themselves, may be detached with the probe and removed. It seems also desirable in the latter stage (as has been emphasized especially by Schwartze and v. Tröltsch) to keep the aperture open as long as possible by means of a leaden nail or a short leaden tube, until we are sure that the mastoid process is in a sound condition. The important point in the after treatment is the regular removal of the accumulated secretion, for which purpose we prefer syringing at first with antiseptic, later with neutral, and lastly with astringent fluids."

Treatment of Chronic Suppuration Catarrh of the Middle Ear.—When the meatus is well cleansed and dried, and the state of the membrane, the drum cavity, and ossicles thoroughly recognised, the question then arises as to the best method of treatment to be adopted. And here I may press urgently the value of close personal attention on the part of the surgeon. I do so the more anxiously in a work intended for the general surgeon, inasmuch as it must fall to his lot to treat many cases of chronic ear discharge accompanied

by perforation and middle-ear accumulations and morbid growths. These are of every-day occurrence in general practice, and the first essential of safety for the patient, as it is for success for the surgeon, is cleanliness. The mere syringing of an ear is not sufficient. The meatus should be thoroughly cleaned out, and the canal and tympanum dried with absorbent wool rolled on the aural probe.

I believe the advice given by Dr Charles Turnbull to be most necessary when he says:—"Teach the patients how to care for their ears. Show them how to syringe or cleanse the tympanum, and how to dry the parts thoroughly, and also how to inflate the ear by Valsalva's method."* This knowledge on the part of patients becomes the more important when they cannot attend frequently for advice and treatment.

Should polypi, aspergillus, caseous growths, granulations exist, these must be removed in the manner already indicated. It must be borne in mind that no case is safe as long as portions of any polypus or masses of granulations are left behind. It is here that great patience and perseverance are required on the part of both surgeon and patient. Should mastoid osteitis and abscess threaten at any time during a chronic suppurating discharge, good may be effected by free leeching over the bone, the administration of salines and purgatives, cautious diet, scrupulous attention to discharge, while, if we cannot hope to arrest the inflammation, incision, as recommended by Wilde, or the use of the trephine may be called for, and ought to be

* *Medical and Surgical Reporter*, Aug. 23, 1879.

unhesitatingly resorted to if the presence of pus is suspected.

Inflammation of the Drum-head—Myringitis.—There can be no doubt that the dermoid layer of the membrane may be attacked with acute inflammation and yet the tympanic cavity itself escape. I am not inclined to look on acute inflammation limited to the membrane as of such extreme rarity as many authors suppose. If this be not strictly true, in an anatomical sense, it is undoubtedly a matter of common clinical experience for inflammatory states of the external meatus to spread to the membrane and locate themselves there, and in the same manner for catarrhal conditions of the middle ear to expend their force on it in the same manner. Yet, independently of any previous external or middle-ear inflammation, I have several times had patients in whom trouble—beginning in an injected state of the drum-head, running on to a general redness, these vascular changes being accompanied by severe intermittent shooting pain—culminated in perforation, or, on the other hand, slowly subsided under treatment without any permanent effect on the hearing. I have seen such inflammation, with permanent deafness, result from an injury, as a blow of the fist on the ear. As Dr Burnett says: "There may be an inflammation localised in the membrana tympani, the external auditory canal being free from inflammation. It would seem but fair to give the name of myringitis to such a disease, and work it out for special treatment." He looks on myringitis as always "an inflammation of the dermoid layer of the drum-head."

I have not the least doubt, from the observation

of a large number of cases, that this strictly localised inflammation does frequently occur. More frequently, however, as we might expect, do we find the drum-head inflamed after the occurrence of a small abscess in the external meatus, or inflammation attacking it in consequence of exposure to cold, or again after catarrhal conditions of the throat and naso-pharynx, in which the Eustachian tube and tympanum are involved. The delicate drum-head may be the first part to draw attention to the mischief by reason of the pain, tinnitus, and throbbing which usher in an attack. Very often such a case as this will present itself. A patient has become slightly deaf in one or both ears, there is a dull, periodical pain, the external passage is sensitive if we stretch the auricle or insert the speculum. On examining the ear we find an injected state of the meatus near the membrane, and the membrane itself, with the manubrium, unusually vascular; or perhaps things have gone a stage further—the pain is more severe and constant, especially at night; there is marked tinnitus, the patient frets, is generally unwell and weak; the movement of the jaw in masticating gives pain. On examining the drum-head there is a full and bulged or flattened look. Perhaps the normal concave appearance is lost, and the whole drum-head presents rather a convex surface, giving us the idea of concealed fluid in the drum cavity. I have perforated in such cases, and have had no result, so far as evacuating any imprisoned fluid.

I have often seen a slight myringitis accompany that severe neuralgic pain for which we are so frequently consulted. If we inquire into the causes of

this affection we will find them much the same as those producing middle-ear catarrh; chief amongst them is exposure to cold and a draught. In the treatment the main object is to arrest and limit the inflammatory process while we relieve the pain. Frequently, notwithstanding any means that we employ, acute perforation will occur, or at least some superficial ulceration of the drum-head. We often find that patients who suffer from myringitis are out of sorts. There is some cause for worry, and a general debilitated and relaxed state of the entire system. Under these circumstances I am in the habit of giving quinine, in 5 grain doses, by itself, or combined with iron. Bromide of potassium, in 15 and 20 grain doses, combined with hydrate of chloral, taken at regular intervals, is a good combination to assuage the pain. The local application of ethylic ether, as I have before advised, in the meatus I have found of service. The first step, however, is to apply leeches to the ear, followed by warm sedative fomentations, and frequently great relief will be obtained from vesication over the mastoid (application of iodine pigment or liq. epispasticus). The throat should be carefully attended to, the ear inflated, and the Eustachian tube kept free, while its faucial orifice, if there is any congestion, is daily touched with a nitrate of silver solution. Dr Blake, in the acute stages, scarifies the membrane, making a few cuts in the prominently congested parts. Should there be fulness and bulging of the membrane, and that we fear any accumulation in the tympanic cavity, far better perform paracentesis.

As regards local douches, I prefer very mild soda,

or common salt or muriate of ammonia (2-5 grains to the ounce), to which is generally added a little glycerin, and the basis carefully-strained poppy water. But I rather avoid douches if possible. Change of air will be imperatively required should the attack become intermittent; and after an attack of this kind it is well, if it can be done, to send the patient from home.

CHAPTER XVI.

INCISION OF THE MEMBRANA TYMPANI.

There are many points in dispute regarding the operation described in this chapter that have little interest for practitioners. The operation for tenotomy of the tensor tympani is one that can only be performed by those who have made many previous sections on the dead body, and whose lengthened and varied experience would enable them to judge of the propriety of advising so delicate an operation, and one necessitating such fine manipulation. This cannot be said of incision of the membrana tympani. Beyond question, every surgeon who undertakes the care of aural cases, and anyone who presumes to treat deafness, or, indeed, to guide the aural complications met with in such acute diseases as scarlatina, the various fevers, and acute inflammatory throat affections, should be ready to carry out this step safely and efficiently. It is not a difficult one, and the landmarks to guide us in its performance are clear and distinct. I will give in a few words my experience of the safety and utility of this procedure. Before doing so, I may perhaps say that the fact of Mr Hinton so emphatically advocating, as he always did, the propriety and advantage of this operation in cases of catarrh of the tympanum, closed Eustachian tube, rigidity of the membrana tympani, in various states accompanied by

obstinate and troublesome tinnitus, in scarlatinous cases, must make us regard it in a most favourable light as a recognised operation, and one which can alone relieve certain morbid states which cause or accompany deafness. In many cases of catarrh of the tympanum, accumulation of mucus, with *incurved* membrane, incision has been followed, in patients on whom I have operated, by results far exceeding my most sanguine expectations. At the same time, I have to acknowledge many negative trials and disappointments. I had the advantage of his advice in carrying out this step in some of my earliest cases some years since. He may have been too enthusiastic as to the ultimate place that this operation would take in aural surgery, yet undoubtedly this enthusiasm was warranted by the brilliant success which attended his treatment of a large number of otherwise hopeless cases, by incision of the membrane and the subsequent thorough cleansing of the tympanum of all accumulated secretion. Nor has the history of the operation and its success with others proved that he over-estimated its value. On the contrary, in the hands of such authorities as Politzer, Schwartze, Gruber, Turnbull, Weber Liel, Tröltsch, Dalby, and others, its value has been completely established. I cannot say how often I have incised the membrane during the past twelve years both in hospital practice and private. But of the many patients on whom I have operated only two suffered to any extent. One of these was an early attempt, and I made the mistake, against which I was subsequently warned by Mr Hinton, of performing a second operation, and leaving too short an interval to elapse after the first incision.

The other was in the case of a lady with a very thick membrane, and, in making the incision, I think I cut a little too freely. These are the only cases I can recall to mind in which I had subsequent inflammation. In the one, inflammation extended to the mastoid cells and tympanum, and there was a profuse discharge for days, resulting, however, strange to say, in a decided improvement of the hearing. The other case had only a slight attack of inflammation of the membrane and meatus, which subsided under treatment. I always perform the operation thus: sitting the patient opposite a good light with the head fixed, and with the mirror throwing the light well down on the membrane through a speculum, I carry a small lance-headed knife, like a very fine cataract knife (a sheathed instrument is preferred by some), steadily down to the membrane with the edge of the blade turned up. I then puncture the membrane, generally behind the handle of the malleus, and carry the blade up to any extent I see fit. There is no bleeding, and but very little pain. The myringotome is shown at fig. 32 (page 77). This is not the instrument, however, that I prefer. I like a knife with a long handle, and shaped like a small cataract knife, with but one cutting edge.

In general practice, the disease in which it is of vital moment to watch for indications for myringitis is the otitis media of scarlatina. And it should be clearly understood that no light save the lamentable ignorance of the benefit derived from this salutary step can explain the large number of terrible cases of destructive inflammation of the middle ear, with its permanent deafness occurring during and after scarlatina. To permit accu-

mulations of pus to gather in the tympanum, the exit of which is prevented by the drum-head, when destruction of the ossicles, collections of pus in the mastoid cells, abscesses, wide-spread inflammation, and large ragged perforation of the membrane itself, may finally result, is, in the face of our present knowledge, highly culpable. Indeed, we must acknowledge that a large percentage of the cases of post scarlatinal deafness, with perforation of the membrana tympani and other lesions, is the result of carelessness or the want of due attention to the throat and ear complications both in the acute stages and during convalescence. Doubtless in some cases the fearful rapidity, the malignity, and the severity of the constitutional fever, is such as to absorb all the attention. Yet where this is not the case, sufficient thought is not bestowed on the throat and nasal passages, the naso-pharyngeal, and palato-pharyngeal tracts. The frequent cleansing of these parts by douches, washes, or sprays, disinfectant and astringent, applied both through the nose and mouth, as well as the occasional washing of the parts out with a brush (perchloride of iron and glycerine, chloride of zinc and glycerine), carried well up behind the soft palate, is essential in dealing with the Eustachian complication.

But it is even more necessary to say a word of caution in regard to the case of scarlatina patients when they are convalescent. Frequently no pain or discharge has attracted attention to the ear, or the hearing, nor has there been any aural mischief apparent in the acute stages, while the throat complications have induced a catarrh of the tympanum and chronic otitis, having as its accompaniment a swollen and obstructed

Eustachian tube, with imprisoned mucus, all of which troubles are apt to be exaggerated during the desquamating period by the general debility and prostration consequent upon the attack. Then it is that we frequently find the otitis resulting in perforation, with catarrhal discharge, sometimes without pain, and consequently neglected by parents, until the deafness attracts attention, or it may be that an acute inflammatory attack of the membrana tympani runs rapidly on to perforation, and the pent-up secretion finds a vent in the ruptured drum-head. It is in cases such as these that the intelligent surgeon has in incision of the membrane a safe and ready means of preventing both further aural mischief, and often the attendant or consequent cerebral complication. We shall refer again to this matter in speaking of inflammation of the tympanum and otitis media.

Of attempts by means of mechanical aids to keep the perforator open after operation I have no personal experience, such as the eyelet of Politzer, the gold or aluminium ring for the manubrium of Voltolini. Dr Weber Liel has succeeded by means of the galvanocautery in maintaining a perforation for three and a half years, first creating a cicatrix in the membrane, and then in the resulting cicatrix making an aperture. But it must be obvious that all such efforts are extremely hazardous. "I have never," says Dr Burnett, "employed either of these two last methods (alluding to Simrock's method of producing an opening by the application of sulphuric acid), nor, in fact, any method to retain a permanent opening in the membrana tympani. The latter structure is emphatically a protection to the

mucous lining of the drum cavities; and rather than incur the probability of a suppuration of the middle ear by exposure, I have refrained from that which would be unlikely to prove of great help to the hearing, but which might be very apt to excite inflammation in the drum cavity. Most aural surgeons will, I fancy, endorse the sound common-sense decision of Dr Burnett in this matter.

CHAPTER XVII.

TENOTOMY OF THE TENSOR TYMPANI.

Having in the last chapter referred to the operation of incision of the membrana tympani, it may be right here to say a word regarding tenotomy of the tensor tympani. I wish to remark that this is an operation the utility of which I have myself no practical experience. I have hesitated to practise tenotomy until more definite results were obtained from its performance, and the cases in which it is indicated are more clearly defined. It may be of interest, however, to describe the steps of the operation, and to give some of the most recent views regarding the benefit derived from its performance and the pathological states which indicate the adoption of this plan of treatment.

Aural surgery is mainly indebted to Dr F. E. Weber Liel for the introduction of this operation, and to Hyrtl for maintaining that, in spasmodic contraction of the tensor tympani, its performance would be attended by useful results (see page 276).

Dr Weber Liel has furnished me with some of the recent criticisms on this operation, and, so far as I am enabled to, I take the advantage of his kindness so as to give the result of his experience and that of other continental otologists on this important subject. I am indebted to Dr Weber Liel for some beautiful prepara-

tions exemplifying the different steps of the operation and the various positions of the tenotome in its several stages. I think the time has come when this operation must be admitted as a recognised and legitimate surgical step in certain cases of otherwise hopeless and progressive tinnitus and deafness. One can hardly doubt that this is so when we read the results of the operation as practised by Dr Weber Liel and others.

Dr Urbansschich of Vienna, in his work (*"Lehrbuch des Ohrenheilkunde,"* 1880), says, concerning this operation: I have convinced myself by experience that what Weber Liel says about this operation is true; it removes or modifies tinnitus, noises, and deafness when caused by pressure in the labyrinth; it has often also an ameliorating influence on the ear not operated upon. In the fifteen cases in which I operated (till the year 1879), four were of no effect; one was attended with a deterioration in hearing, and ten were improved, some considerably. Besides the improvements before mentioned, several patients announced an abatement or entire cessation of the former fullness of the head; low spirits and fleeting neuralgia in the region of the trigeminus.

In the case of one patient a bilateral supraorbital pain also disappeared after the operation. Tenotomy of the tensor tympani seems to have least effect on deafness, and in some cases when it proved effective, the amelioration only lasted some weeks or months. In simple cases, however, the improvement still remained after the lapse of a year and a half. In one of these cases, the patient, after the operation on the one ear, experienced in the course of some weeks a decided improvement in the hearing of the other ear, which

even surpassed that of the operated one. In this case the improvement still continues, though in the case of another patient a similar sympathetic lessening of the deafness disappeared again in the course of a week. The above results of tenotomy of the tensor tympani would encourage a further trial of it, but I am hardly yet competent to give a decided opinion of the step, as my operations have only extended over a period of a year and a half, and within that time many patients who seemed at first much improved afterwards deteriorated, and the final results of the tenotomy did not seem very considerable.

Professor Dr Miot of Paris, speaking of tenotomy of the tensor tympani, says: I was one of the first in France to admit tenotomy of the tensor muscle into my practice, at first as an experiment, afterwards as a current operation.

Immediately after the operation, there is a disappearance or diminution of the tinnitus, which is replaced by a slight noise somewhat like that produced by holding a shell to the ear on a level with the meatus. But the noise is so feeble compared with the insupportable tinnitus, that the patient feels his head much relieved, and is well pleased with his new condition. Sometimes the diminution of the tinnitus is gradual, and we may have to wait several weeks for a definite result. In other cases the tinnitus returns again, in consequence of a new retraction of the tendon which reunites. A second operation, similar to the first, is then necessary to maintain the amelioration; it ought not, however, to be performed in less than two months after the first. In most cases it diminishes by a half or two-thirds or disappears completely, but to obtain this last result, it is necessary

to perform the operation before any organic lesions, other than that of the tensor muscle are produced, as for example, those of the stapedius and of the oval window. The operation also modifies advantageously the buzzings produced by the intralabyrinthine pressure, because the section of the tendon causes the compression of the liquids of the labyrinth to cease (Weber Liel), a compression which modifies the circulation of the internal ear.

Deafness is diminished after the disappearance of inflammation, when other pathological modifications of the internal ear do not exist. Deafness, however, is not much lessened when the lesions are far advanced.

In some cases no after treatment is necessary except to inflate morning and evening the drum with air by the process of Valsalva, and to inject into the ear twice a-week, over a period of fifteen to twenty days, a solution of chloride of ammonia.

In a letter received from Dr Weber Liel, he points out that Hyrtl merely referred to tenotomy of the tensor tympani in regard to its effects on the tension of the membrani tympani, and the hearing of deep tones, not to the intralabyrinthine pressure, and its consequences, as seen in tinnitus, giddiness, or progressive deafness.

Dr Weber Liel also objects strongly to the method of criticism of Dr Schwartz, from his want of clinical data. The same observation applies to Dr Hartmann, whose experience Dr Weber Liel pronounces most limited as compared with his own after close on five hundred operations on the *living* subject. To do Dr Weber Liel justice, he equally strongly objects to the prematurely

favourable assertions from limited experiences, such as those given by Dr Gruber. He also protests against the imperfect imitations of his operation, and the neglect of subsequent treatment, which he looks upon as most essential for success, and hence from want of prolonged observation, the unreliable evidence of the permanent good effect. Dr Weber Liel, on the other hand, has noted direct results in a number of cases for as long a period as twelve years after an operation.

Dr Weber Liel thus sums up the indications for, and the therapeutical effects of, the operation, in the communication which he has kindly forwarded to me :

“First, By means of the operation and the subsequent treatment by the air douche, and intra-tympanic pressure by means of the koniontron, used to prevent reunion of the tendon, we are enabled in a large percentage of cases, in so-called nervous ear disease to afford relief and arrest its progress.

“Secondly, Tinnitus either entirely disappears or is greatly modified. It appears that there is a pretty constant relation between the tinnitus and the character of the deafness, as the difficulty of relieving the latter may be decided by the influence the operation exerts on the noises.”

The following (taken from a translation by Drs Alexander Loos and Laurence Turnbull), are Dr Weber Liel's reasons for advocating tenotomy.

“First, (a) That according to the experiments of distinguished investigators, it seems established that the musculus tensor tympani, under a normal condition of things, keeps not only the membrana tympani and the series of bones with the apparatus connecting them, but

also the labyrinth by means of the stapedial bones, under a certain degree of permanent tension ; and that accordingly it is also correct that an anomalously strong tension of the muscle brings not only the membrana tympani into a hypertension which hinders the normal reception of sound waves, but likewise places the bones of the ear in too high a degree of tension, which does not promote the transmission of sound waves, and also at the same time subjects the intra-labyrinthine phenomena to an increased pressure.

“(b) That it may be assumed (see my argument for this assumption in the dissertation “On Secretions” in No. 11, 1870, and No. 1, 1871, ‘of this monthly’),* that a permanently-increased tympanal and intra-tympanal tension (especially with a frequently occurring simultaneous disturbance or interruption of the ventilation of the Eustachian tubes, *i.e.* with an obstructed access of air into the cavity of the tympanum, with the unavailability of respiratory and motory forces for the intra-tympanal circulation of the blood, on account of limited vibrations of the membrana tympani, &c.), may also furnish the first and continued cause, even without this concurrence of vasomotor disturbances or obstructions in large vessels, for an alteration of the intra-tympanal circulation, and thereby for disturbances of the tympanal and intra-tympanal sustentation, for the superinducing of hyperæmia and secondary catarrh, and, in consequence of this, for the thickening and induration of the living membrane of the intra-tympanal structure.

“(c) That likewise an increased pressure within the

* “ Monatschrift für Ohrenheilkunde.”

labyrinth, transferred and sustained by the tensor tympani, may finally not only lead to alterations of the circulation and oscillations within the labyrinth, especially when the possibility for a compensatory or collateral yielding to the excessive pressure is made difficult by other disturbances (such as intracranial excess of pressure, hyperæmia in the brain, &c.), but also by the very same cause the reception of sound-waves and the oscillatory capacity of the intra-labyrinthian apparatus must necessarily be lessened.

“(d) That it may be admitted that by the concurrence of all these causes a very great decrease in the faculty of hearing must gradually be developed, while at the same time, in consequence of the irritations by intra-labyrinthian pressure and of the obstruction of circulation, subjective noises in the ear, and symptoms of dizziness are noticed. This may, *e.g.*, be illustrated by cases in which the cavity of the tympanum is exposed and only the stapes is preserved; if a pressure is exerted upon the head of the stapes by means of a blunt probe, the patients immediately complain of noises in the ear which previously did not exist, and also in some cases of considerable congestion or dizziness.

“(e) That, finally, it is probable that an immovableness of the bones of the ear which is permanently sustained by an active or passive tension, or shortening of the tensor tympani, may furnish the only or accessory cause not only for the ankylosis of the articular connections of the bones of the ear, but also on account of the simultaneous permanent pressure of the stapes into the fenestra ovalis, on account of the continuous

locally-sustained irritation of pressure, and of a super-induced sectional afflux of fluids and obstructed communications, for the vascular anastomoses, mediated by the membrane of the fenestra ovalis, for the development of a synostosis (synosteosis) in the connection between the stapes and vestibule (especially with predisposed gouty or rheumatic individuals).

“Secondly, That on the other hand the observation of patients, especially those submitted to *post-mortem* examination, shows that the tensor tympani muscle may be completely inactive, atrophied, or in a state of fatty degeneration, and that, with the ulcerative destruction of the membrana tympani and of the bones of the ear, even its tendinous termination may be completely lost, and yet, provided the stapes only exists and is movable, the function of hearing may be preserved in a degree sufficient for intercourse (the hearing being preserved for two inches, the normal hearing distance being forty).

“This would show that the principal perceptible functions of the tensor tympani commence only at a certain ‘*quale et quantum*’ of the requisition made upon the organ of hearing; and experience further shows that even in spite of an accidental single injury and destruction produced by the penetration of foreign bodies into the tympanum, a subsequent appropriate treatment may prevent the occurrence of dangerous inflammatory symptoms of reaction, principally by the prophylactic inner application of *oleum terebinthinae*.

“That, finally, the preliminary experiments in the performance of tenotomy of the *musculus tensor tympani* on a dead body enables us to find a *modus operandi*

by means of which the cutting of the tendon of the tensor can be done without touching other important formations of the tympanum, without laxation of the bones of the ear, especially without tearing the stapes from the fenestra ovalis."

Hence he considers that tenotomy of the tensor tympanum is indicated in (a) those cases of "progressive disturbances" of hearing accompanied by subjective phenomena "with and without additional symptoms of dizziness," or tinnitus aurium, and where all other therapeutic means had failed;

(b) Those cases in which objective symptoms such as contraction of the membrana tympani: fixation and retraction of the malleus, and where "the anterior portion of the membrana tympani stands back from the sharply projecting edge of the handle of the malleus and is immovable." In these cases he points out that the state of tympanal and intra-auricular hypertension before referred to exists, and that in removing the tension caused by the retraction of the tendon of the tensor tympani, we at least remove one factor, and that a powerful one, which increases the pressure on the labyrinth.

The most favourable cases for tenotomy he considered would be such as were only partially relieved by the air douche, and in which a temporary, but not a permanent, improvement was effected. The following, quoting from the same translation of Drs Loos and Turnbull, is the description of the operation as originally performed by Dr Weber Liel:—

This operation requires,

1. *A tenotome*, constructed in such a manner that the

manipulations and excursions necessary for securely holding and cutting the tendon of the tensor can be transferred and performed outside of the "meatus," which does not well admit of any other procedure on account of its narrow and tortuous construction. After many preliminary experiments upon the dead subject, I had two tenotomes made (an illustration of one of which is figured in the drawing).

It is connected with an angular lever, *a* and *b*, according to the pattern of the myringotome devised by Dr Wreden; the other with a lever to be moved by a cogged wheel. Although both instruments proved equally efficient in the experiments upon dead bodies, and though the latter admits still more easily and securely the necessary quarter-turn of the tenotome within the tympanum, I have thus far used only the rectangular lever with living persons, because my first operations with it inspired me with confidence in the necessary manipulations, and because after a successful operation according to a certain method one does not like to abandon it for another.

2. *Aural specula* for the external meatus. I have had them made of very thin caoutchouc, and so short that they do not protrude beyond the level of the meatus, else they hinder the necessary manipulations to be made with the tenotome outside of the meatus.

3. An apparatus by means of which the patient's head is secured in the position most favourable for the operation, in such a manner as to prevent any motion on their part which might endanger its success while the knife enters the cavity of the tympanum and performs the cut.

Connected with this apparatus is a tongue-shaped clamp which holds the external ear from behind, and for the sake of straightening as much as possible the

Fig. 55.



Weber Liel's Tenotome.

meatus, which is otherwise angular, keeps it drawn backward, outward, and upward.

Connected with this head-rest is an aural mirror, by means of which an observer can follow the steps of the operation.

After fastening the patient's head, by means of the head-strap, obliquely into the head-rest (secured to a table which, if possible, is itself securely fastened) in such a position that at the same time the patient's shoulder, which must be as low as possible, does not hinder the motions of the operator or of the instrument, and so that the daylight of a sunny sky can enter the meatus and clearly illuminate the membrana tympani *in toto*, the operator seizes the tenotome, which is adjusted straight, as shown in the illustration, at the handle in such a manner that the thumb of the corresponding hand rests upon the head of the lever slide. For the tenotomy in the left ear I use the left hand; for that in the right ear the right. It seems necessary to me that the physician, in order to be able to perform this delicate operation in every case elegantly and securely, should be ambidextrous.

The tenotomy is performed in four steps:—

First step.—Introduction of the tenotome, its handle, behind and outside, in a position more or less approaching the horizontal, into the meatus, and piercing the membrana tympani with the upper sharpened edge of the hooked knife about $1\frac{1}{2}$ mm. in front of the handle of the malleus, somewhat below and to the side of the short process.

Second step.—Pushing through of the hooked knife into the tympanum. While the handle of the instrument is lowered and inclined forward, the hooked knife, conducted by most accurate knowledge of the anatomical relations, forthwith extends over the tendon of tensor, controlling it from the front; while the operator accurately feels his way to ascertain whether the tendon is

indeed under the control and within reach of the hook, he must see that the hooked knife comes neither too near the insertions of the tendon at the handle of the malleus (so as not to injure the chorda tympani), nor too near the wall of the tympanum. In neither of these two cases can the operation be successfully performed, since at the subsequent quarter-turn of the hooked knife, although edge and point are made so as to turn somewhat outwardly, it is either entangled in the lower back part of the membrana tympani, which is umbilically drawn inward, or pushes against the wall of the labyrinth and the stapes.

Third step.—While the hooked knife is firmly adjusted upon the tendon of the tensor, the operator exerts a light drawing pressure upon it, and while the handle of the tenotome is directed forward (toward the patient's face), the bottom of the lever (in the groove of the handle) is pressed downward. This causes the hooked knife to make a quarter-turn forward, and the tendon of the muscle is cut still more securely by the lower edge of the knife, so that it cannot well escape. In the moment of the successful cutting of the muscle a distinct cracking noise is usually heard.

Fourth step.—While the operator must endeavour to keep the little knife intra-tympanal as much as possible in the anterior part of the cavern tympani (in order not to strike the connection between the incus and stapes, or the stapes itself), the lever button at the handle of the instrument is pressed somewhat backward so as to restore the hooked knife to its former position, and to make its removal from the slit-shaped wound of the membrana tympani easier.

"The operation is performed without anæsthesia; even very sensitive patients assert that it is not particularly painful."

In the "Philadelphia Medical and Surgical Reporter" of January 1877, Dr Turnbull contributes a valuable article on this subject. Dr H. Schwartz, he says, attributes the good results rather to the incision of the membrane than to the division of the muscle, but in this he (Dr Turnbull) does not agree with him, inasmuch as he had previously incised the membrane, in the cases published by him, without a good effect. He refers to Dr Kessell's experiments on the lower animals, in which considerable injury was done to the ossicula, without any bad results, and in which the endo-lymph escaped, to prove that there is not the danger attending division of the tensor tympani that we might imagine.

Dr Schwartz's results have not, however, been favourable; quite the contrary. "He has never, in any case operated on by him, been able to bring about a permanently favourable result." On the other hand, cases have been recorded in which "violent inflammation, extending itself from middle corto-labyrinth, with extensive impairment of the hearing, and an aggravation of the subjective noises" has taken place. Dr Schwartz uses a very simple tenotome (fig. 56).

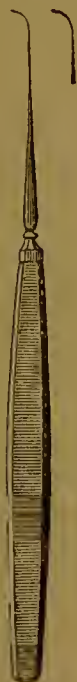
"A separate instrument is required for each side. He first makes an incision with the paracentesis needle behind the upper end of the handle of the hammer and short process, and then introduces the tenotome into the cavity of the tympanum, with the bent point upward, and in a direction toward the tensor tympani, and afterwards turns it at right angles, so that the edge lies over

the tendon. This is then divided by a sawing motion, without, however, the exertion of much pressure."

He does not use chloroform or fix the head.

"Immediately after the cutting he can generally see (unless the membrana tympani is very opaque) the

Fig. 56.



Schwartz's Tenotome.

Fig. 57.



Hartmann's Tenotome.

accumulation of blood behind the membrane, this, however, becoming absorbed in a few weeks."

In the same paper, Dr Turnbull gives the experience of Dr Hartmann on this operation. From a series of experiments Dr Hartmann concludes that the disrepute into which the operation has fallen, depends on the non-

division of the tendon, or its incomplete division. He lays stress on the following points:—

The incision must be made through the posterior segment; the tenotome must have a curve to reach the tendon, which lies high (1 mm. above the upper edge), the cause of failure in many cases arising from making the incision too low. He thinks Weber Liel's instrument too complicated, and with it there is risk of injuring the malleus and malleo-incus joint.

Taking these points into consideration, he operated on a patient given him by Politzer, from the posterior segment, with an instrument curved slightly on the flat surface, 2 mm. wide, and so sabre-like curved that, holding it in the position for operation, the point will rise above the upper edge about 1 mm. An instrument is required for each side and fitted in a handle (fig. 57, page 287).

For the operation, puncture $1-1\frac{1}{2}$ mm. behind the handle of the hammer, just below the level of the short process; push the instrument, with the handle slightly elevated, to the middle of the cutting part of the blade, at the same time keeping the handle close to the posterior wall of the canal. Now the handle is lowered, the instrument slowly drawn back, and at the close the handle is again elevated. In this way the tendon is cut from below, in a direction from front to back, avoiding the inner extremity of the upper wall of the passage, and the neck of the hammer which lies close to it. In performing this operation, we have to avoid puncturing too close to the hammer, for fear of striking it on the other side of the membrane. After passing the knife about 3 mm. into the tympanum, the handle is moved

to the posterior wall of the canal, to avoid the promontory ; the chorda tympani was, in several cases, not touched, nor was the long leg of the incus.

He claims the following advantages :—

1. Simplicity and ease of performance, owing to the very slight change in the position of the knife after entering.

2. The instrument having a gradual curve, is not so liable to injure the parts, in case of sudden inadvertent motions, as those with sharp angles.

3. The operation can be done without confining the head, and thus rids patients of their greatest dread.

4. As the cutting is done by a drawing motion, and not by pressure, lacerations of the membrana tympani and ossiculi are more easily avoided.

He is of the opinion that we can only judge of the importance of tenotomy by excluding the influence of other factors which come into play in the performance of the operation. He refers here particularly to the paracentesis of the membrana tympani, and, in the posterior operation, to the division of the posterior fold. He thinks, before tenotomy is attempted in any case, the paracentesis, or division of the posterior fold, should be tried.

Dr Weber Liel thus further classifies the cases in which tenotomy is indicated.

(a) Those in which the deafness is not far advanced and the patient can hear when spoken to directly into the ear.

(b) Those in which deafness is associated with tinnitus.

(c) If the examination of the membrane makes it

improbable that there are adhesions in the zone of the tensor muscle or a retraction or contraction of it.

(*d*) When suction or rarefaction produces slight temporary benefit, and diminution in the noises and the deafness.

Dr Weber Liel refers to the operations of Kessel for removal of the ossicles, or even the membrana tympani in its entirety, and section of the stapedius as being consequent upon his operation of tenotomy of the tensor tympani.

Thirdly, The symptoms of megrim giddiness, &c., which are common attendants on this class of case disappear frequently the day after the operation.

Fourthly, The good effects of the operation appear to be in proportion to the duration of the symptoms, nor does there appear to be any certain indication of its success. But Dr Weber Liel asserts that though it may be thus unsuccessful in the operated ear, the other ear which is not interfered with is materially benefited, and even hearing power restored completely, and likewise the noises disappear in it.

Fifthly, Secretion of cerumen is promoted, and returns where it has been absent; attacks of megrim and other disturbances which have been attendant on the aural trouble cease.

At the International Congress* this year, Dr Paquet of Lille proposed an operation which he had found successful; a combination of that of Weber Liel's, in which there is section of the reflected tendon of the tensor tympani muscle, and of that in which an incision, with or without excision of a portion of the membrane, is

* Abstract from the published Proceedings.

practised. The blade of the knife he uses is 2 mm. in breadth and 4 mm. in width, bent slightly, like a scythe.

The procedure is as follows:—A puncture is made $1\frac{1}{2}$ mm. in front of the hammer, and the membrane is divided obliquely, downwards and backwards, in such a manner that the lower extremity of the incision is placed half way between the umbo and the periphery, and at a point where a line drawn vertically downwards from the umbo would meet it. This incision divides not only the membrane, but also the reflected tendon of the tensor muscle, or at least the tensor ligament of Toynbee. A second incision is now made in the posterior segment 2 mm. from, and parallel with, the manubrium, and then passes forwards to meet the lower end of the first incision.

By excising a portion of the lower end of the V-shaped curtain thus made, the perforation is rendered durable.

CHAPTER XVIII.

SOME SPECIAL CAUSES OF AURAL DISEASE AND DEAFNESS.

Bathing.—I cannot pass over this important and frequent cause of impairment of hearing, the result of inflammation of the membrane, tympanic inflammation, or the passage of water into the tympanic cavity, without drawing attention to it, though very briefly. Constantly I have been consulted for deafness produced by sea-bathing. In the cases I have seen, the general conditions have been thickening of the membrane, fluid in the tympanic cavity, and closure of the Eustachian tube. I have before noticed the occurrence of exostoses within meatus in persons fond of sea-bathing. In some there has been either a recent or remote history of inflammation in the auditory meatus, with pain; but frequently all that the patient complains of is tinnitus aurium, accompanied with deafness, which, though at first slight, goes on steadily to a most unpleasant and troublesome pitch.

“The symptoms,” Turnbull* says, “of water in the middle ear are, in the first stage, an uncomfortable sensation, followed by ear-ache or pain, which after a time becomes agonising, and is accompanied with great tenderness behind the auricle.” The accident does not

* Paper, International Congress, 1876.

so often occur with expert swimmers as with the young and inexperienced, who in diving or otherwise from the shock or cold involuntarily fill the mouth and pharynx with cold sea-water, a portion of which passes into the open Eustachian tube and tympanic cavity. In such cases the mischief may before long extend to the brain, and the most alarming symptoms, delirium and coma, result. Inflammation in the cavity of the tympanum, extending to the naso-pharyngeal tract, is followed (Turnbull) by a purulent effusion, which immediately indicates incision of the membrana tympani to give exit to the pus. If there be a discharge, chronic in character, from the meatus, Turnbull advises a powder of "salicylic acid and starch, blown into the meatus, and after a time washed out, reapplied twice daily until the discharge has ceased, and the perforation has healed." I have not seen many acute cases; but I have frequently observed instances of permanent and incurable deafness, with troublesome tinnitus, when the origin of the affection was clearly traced to bathing. In the more recent and milder cases, I have had the best results from alkaline injection into the tympanum with the Eustachian catheter, and air douche. Frequently we are asked our advice as to the prudence of bathing by aural patients. It is well to remember these dangers, especially when perforation of the membrane is present, or inflammatory and altered states of the tympanic membrane or cavities. I never permit an aural patient to plunge into cold water. Turnbull advises the head to be placed to one side, holding the ear well out and opening the mouth, when water is found to enter the ear.

Malaria.—Dr Weber Liel has written several valu-

able papers* on forms of intermittent ear affection due to malarial influences. At first, it may be, there is nothing felt save a fulness in the ear, giddiness, restlessness at night, perspirations. These symptoms subside, to be followed the next evening by a rigor and pain in the ear, accompanied by violent tinnitus and deafness. This may go on to perforation of the drum-head. These symptoms abate, leaving only a slight deafness and tinnitus. Pressure on the tragus does not cause pain. These rhythmical attacks succeed each other with more or less severity. One ear generally suffers most, but the other is not altogether free. Such attacks may assume the quotidian or tertian type, and occur occasionally for months. The cells of the mastoid may be attacked, and exudations take place into them. Despite of treatment, recurrent attacks of pain at night follow each other, to be relieved only by large doses of quinine. Dr Weber Liel says that in such cases he has found the spleen tender and enlarged. This tendency to intermittent aural attacks is not as a rule met for the first time in a healthy ear, but follows on some chronic condition that has preceded it. Abscesses in the external meatus (*furunculus*) often assume this intermittent character, and yield equally to quinine. Malarial influences in unhealthy dwellings or surroundings will often be found as the true exciting cause of such aural affections. Change of air is the cure for such cases, quinine being administered in large doses at the same

* "Ueber fragmentäre, larvirtu Formen des Wechselfiebers im Gebiete des Gehörorganes Malarianeuralgien im Gebiete des Tre-geminus," 1878; "Monatschrift. f. Ohrenheilkunde," No. 11, 1871; "German Clinical Studies," No. 5, 1874; "German Practice of Medicine," Nos. 15, 16, 1877.

time. Dr Weber Liel calls the disease otitis intermittens. The accompanying neuralgic pain is distributed over all the branches of the trigeminus, with extension into neighbouring nerve districts. The vasomotor disturbance is shown in the fulness of the vessels, and the catarrhal condition of the middle ear, which, with the consequent exudations, is the result of the paralytic dilatation of the vessels of the tympanum and internal ear. These intermittent paroxysms are frequently associated with rhinitis or pharyngeal catarrh and attendant coryza. I have had several patients under my observation from time to time with attacks of intermittent neuralgia of the ear, with but slight accompanying deafness, in which quinine in large doses alone proved of any service. I have no doubt that many cases of aural catarrh, furunculus in the meatus, severe neuralgia, with accompanying throat catarrh, owe their origin to defective hygienic surroundings.

Dr Cassells had, in 1878,* drawn attention to the influence of foul air emanating from defectively constructed sewers, foul drains, &c., in producing ear disease. Three members of his own family were attacked with severe otitis media. Dr Cassells performed paracentesis on all three, evacuating a quantity of pent-up serous fluid from the tympanum with marked benefit and permanent relief. Another child was subsequently attacked. In her case, by repeated paracentesis, "large masses of tough jelly-like mucus were removed." On close examination Dr Cassells found that "there was an escape of sewer gas from two of the closets into the house." Dr Cassells quotes several other instances of

* "Edinburgh Medical Journal," January 1878.

deafness occurring in connection with defective drainage and sewage. Complete relief to the patients followed upon change of air. Some of these patients suffered from recurrent attacks such as those described by Dr Weber Liel.

Syphilis.—Primary syphilis of the ear must be extremely rare. I have never seen a case. Syphilis, however, occasionally attacks the ear in the form of secondary cutaneous eruptions or condylomata of the auricle. I have seen some well-marked cases of syphilitic secondary affection of the middle ear. They were of a chronic catarrhal, non-suppurative nature. They have entirely, the patients being still on and off under observation, yielded to constitutional and specific treatment. In one or two cases with accompanying syphilitic retinal affections, I have had evidence of internal ear mischief, tinnitus, giddiness, cranial or occipital pain, with deafness. I have in secondary syphilitic patients, in addition to such treatment as mercurial inunction, iodoform, iodide of potassium, found the greatest and most permanent benefit from a course of baths at Aix-la-Chapelle.

Hereditary Syphilitic Deafness.—I have already referred to the large number of cases of deafness which are due to inherited syphilis. I have also briefly alluded to the other characteristics which enable us to detect the syphilitic taint. I have remarked that in many of the patients there is no abnormal appearance of the membrane that can be looked on as pathognomonic. In several others I have seen the membrane dull and thickened, it has lost its transparency, is rather of a grey colour, and inflates with a dry click. I believe,

however, that it is *impossible* to define any typical appearance in this affection, in which I regret to say that treatment has with me proved of little avail. If taken in the early stages, or when the symptoms first manifest themselves, much may be done by mercurial treatment (inunction), followed by iodide of potassium internally, at the same time that the Eustachian tube is attended to and the tympanum kept free by warm iodide of potassium injections. But when a case comes with extreme deafness (both with the watch and tuning-fork), and presents the characteristic teeth of Hutchinson, and the proofs of an attack of interstitial keratitis, either remote or recent, I do not hope for a good result from *any treatment*.

Dr Pierce, of Manchester, read an exhaustive paper on this subject at the recent Congress. He gives the following summary of the characteristics of acquired and congenital syphilis:—

As a summary of the characteristics of acquired and congenital syphilis affecting the ear we see—

1. Extreme degree of deafness manifested early in the progress of the disease.
2. Rapidity of progress and absence of pain.
3. Early and extreme loss of hearing for the tuning-fork over the vertex.
4. Frequent imperviousness of both Eustachian tubes.
5. Constancy of the tinnitus, of a hissing kind.
6. Frequency of simultaneous inner symptoms.
7. Improvement of pre- or co-existing eye affection.
8. More decided affection of the naso-pharynx than in catarrhal ear disease.
9. Less complete recovery than in simple catarrh.

On Nervine Deafness.—I propose to group under the heading of this chapter some general remarks on various forms of deafness more commonly associated with a train of symptoms indicative of brain or nerve trouble. I have already alluded incidentally to several complications of catarrhal states of the middle ear which clearly point to subjective disturbances in the brain, and in that form of aural disease known as progressive deafness, so well described by Dr Weber Leil. In discussing the operation of tenotomy of the tensor tympani and the etiology of tinnitus aurium, necessarily those states of the tympanic and tubal muscles which are produced by various nervine disturbances were referred to. It must be of interest to the practitioner to note more particularly some of the symptoms that indicate special brain and nerve disturbance, and the influence of treatment, more particularly electricity, on these most troublesome and at times intractable affections.

Ménière's Disease.—The most interesting paper recently published on this disease is that of Dr A. Guye of Amsterdam, read at the International Congress, 1880, in that city, a copy of which he has kindly sent me.*

Dr Guye laid before the Congress these propositions :

1. Ménière's disease, or the symptoms of Ménière's disease, include in the most general use of the term all those cases in which a sensation of vertigo is caused by abnormal irritation of the nervous terminal apparatus of the semicircular canals.

2. In a narrower sense, we must include under Ménière's disease those cases of inflammatory processes

* The "Archives of Otology," vol. ix., No. 3, Sept. 1880.

in the semicircular canals themselves, or in the middle ear, producing vertigo, which is either continuous or caused by normal movements of the head, or appearing only paroxysmally after intervals of weeks or months.

3. Most if not all the cases of Ménière's disease are of a secondary nature, *i.e.*, they are due to inflammatory processes in the tympanum or antrum mastoideum.

4. In typical cases the vertigo is preceded or accompanied by sensations of rotation in regular progressive steps; first we have a sensation of rotation about a vertical axis, and constantly *toward the affected side*, oftentimes to and fro, but never simply toward the healthy side; this is followed by a sensation of rotation about a transverse axis forward and backward; the vertigo then generally becomes complete, and the patient swoons, with or without loss of consciousness and vomiting. The attack in some cases usually passes off in from two to thirty minutes; in others the sensitiveness to every movement lasts one or two days, during which the patient must rest in bed.

5. Sensations of rotation are sometimes produced by external therapeutic applications to a diseased ear, such as forcing air into the tympanum, in some cases of acute inflammation of the tympanum, syringing water into the antrum mastoideum after perforation of the mastoid process, when the water escapes either through the external auditory meatus or the Eustachian tube. In such cases the sensation of rotation is constant around the vertical axis and *toward the affected side*.

6. The seizures are often accompanied by intense subjective sensations of hearing, which in many cases continue permanently in a moderate degree, and without

exacerbations during the seizures ; in rarer cases subjective sensations of hearing are wholly absent.

7. In long standing cases, a slight feeling of vertigo persists even between the attacks, and is noticed especially on first moving the head after awakening from sleep. Or there may be a feeling as if one were falling forward or backward, or a forced and stiff position of the head, because every movement in the plane corresponding to a given semicircular canal makes one feel as if a piece of lead were moving simultaneously in the same direction. In one very pronounced case of my own, the head was held forward and to the left, corresponding precisely to the plane of the left sagittal canal. The left ear was the one affected.

8. Conditions simulating chorea in children, and chronic contractions of the face and upper extremities in adults, to say nothing of frequent complications with hysteria, may develop themselves in the course of the disease, and disappear wholly after local treatment of the affection of the ear.

9. The affection can be relieved with or without loss of hearing. Local treatment is most successful in cases that are not too old, and often in the most hopeless cases.

Amongst internal remedies, quinine, as recommended by Charcot, deserves most reliance, in so far as it often lengthens the interval of freedom from attacks during the course of its exhibition. Quinine, moreover, often acts paradoxically in chronic affections of the ear, by wholly removing the previous tinnitus, while so increasing the deafness temporarily during the course of its exhibition.

With regard to the ætiology of this affection Dr Guye regards the causes of middle ear catarrh such as sea-bathing, cold, exposure to draughts, and nasal abnormalities, as the most frequent. But I have seen marked cases of Ménière's affection where there was no such connection. In a few cases there was a history of syphilis, in some there were accompanying retinal lesions. Fissures of the skull, Dr Guye remarks, may cause the disease during cicatrisation. Dr Guye lays special stress on the sensation of rotation occurring most frequently about a vertical axis and in the direction of the affected ear. Following the views of Mach, Breuer, and Crum Brown, that the sensation of movements of the head is situated in the semicircular canals, section of which (Flourens) gives rise to involuntary symptoms of rotation, he at the same time differs from Mach and Crum Brown that "each canal corresponds only to the sensation of rotation in a single direction, or that the sensation of rotation is produced in an opposite direction to the irritated canal." He reports it as a fact that the sensation of rotation on the left horizontal semicircular canal is a sensation of rotation to the left, and in the right horizontal semicircular canal to the right.

The treatment of a patient affected with the annoying symptoms of Ménière's disease will be primarily directed to any disordered function of the middle ear, Eustachian tube, nose, and naso-pharynx. Next we must seek for any constitutional cause, and attend particularly to the hygienic surroundings of the patient, by tonics, change of air, healthy food, avoidance of tobacco and stimulants. In the shape of medicines I have most faith in

the combinations, iodide with bromide of potassium, bromide and phosphide of zinc, hydrobromic acid and quinine, strychnine and iron, given as they are indicated, than in any others.

The troublesome nausea and sickness that at times attends attacks may be best combated by such medicines as hydrocyanic acid, ingluvin, bismuth, oxalate of cerium.

Galvanism and Electricity in Paralytic Deafness.—I have already had occasion to notice the importance of both the constant and induced currents in various parietic stolis of the tympanic muscles, and also the muscles of the Eustachian tube. I know no more convenient instrument for galvinising the muscles of the soft palate and Eustachian tube than the laryngeal galvaniser of Dr Morell Mackenzie. This appliance in its reduced form I have already alluded to (page 95) and figured. In important communications made to the otological sub-sections of the British Medical Association both at Cork and Cambridge, Dr Woakes, who has devoted considerable attention to this subject dwelt on the power of electricity to relieve the symptoms already described under the head of "Progressive Ear Deafness." At the Cambridge meeting Dr Woakes said*—

"Suffice it to say that there appear to me two distinct phases of paralytic affections of the auditory apparatus—viz., that described as 'progressive' deafness by Weber Liel, and that which I have elsewhere described as 'parietic' deafness. Now the importance to our present purpose of these observations, resides in

* "Brit. Med. Journ.," July 16, 1881.

the fact that it is in these paretic aural affections that galvanism will be found of essential service. That is to say, it is in the treatment of deafness in adult life, when this acknowledges a more deeply seated constitutional lesion of the nervous system, that the true province of electro-therapeutics, as it relates to otology, will be found to lie. Speaking strictly within the limits of my own experience, I have to regret that, even in this large class of cases, the use of electricity is essentially a limited one. The reason of this resides in the fact that we seldom meet with uncomplicated cases; for it is inherent in the nature of any affection which interferes with the function of the Eustachian tube—as paralysis of its muscle does—to induce a greater or less degree of passive congestion of the middle ear. Now it has been conclusively shown by the experiments of Morant and Dastre, a detailed account of which will be found in the “*Comptes Rendus*,” 1878, that, after galvauising motor nerves, there follows considerable hyperæmia in the tissues to which the branches are distributed, which condition will endure for some days. This effect is due to the circumstance that nearly all such nerves contain vaso-motor fibrillæ, and is owing to the dilating influence of the galvanism on the vessels to which these vaso-motor filaments are ultimately distributed. Therefore, while the application of the electric current will tend to restore the motor power of the muscles to which it is applied, it will at the same time perpetuate, if not increase, the already existing congestion of the middle ear.

“This, I take it, is the reason why deaf patients subjected to the treatment in question fail to afford

results proportionate to the restoration which we know has accrued in the muscle-power of the tube in consequence of their successful electrification.

“Obviously therefore, the question of the use of electricity in a given case of ear-disease is not one to be decided without due deliberation and the exercise of considerable discrimination. These are points on which, doubtless, much information will be elicited from the discussion of the subject. Other points, respecting which the experience of each practitioner will give valuable hints, are, the kind of current suitable to the case to be treated, whether the continuous, the interrupted, or the induced current; also the strength of the current and the frequency of application. Speaking on these points from my own experience, I may say that I have nearly abandoned the constant battery for therapeutic purposes, and use most frequently a very weak induced current, and never repeat the application oftener than once a week.

“Respecting the instruments necessary for the purpose, the simpler they are the better, providing efficiency be not sacrificed to obtain this end.

“Galvanisation of the tensor tympani muscle with certainty can be best accomplished by means of Weber Liel's intratubal electrode. It consists of a delicate gum-elastic catheter, which is introduced into the Eustachian tube to the desired length through an ordinary catheter. Through it runs a platinum wire, which is exposed for a short space near its distal end by means of an opening at the side of the elastic tube. The near end of this wire is attached to a ring, to which the cord communicating with the battery is

hooked. The other pole can be applied by means of a sponge-holder either to the mastoid process or an indifferent part."

Mr Field in the last edition of his work on diseases of the ear, says: "Faradisation no doubt stimulates the intrinsic muscles of the ear, and therefore enables them to perform their function. The stapes often remain fixed within the foramen ovale in certain cases of tinnitus.

"Such a condition doubtless does, from the continued pressure of the stapes on the internal ear, induce a constant formation of false sounds. The partial withdrawal of the stapes, effected by contraction of the stapedius muscle, would be followed by a reduction or temporary removal of such false sound; and I would therefore suggest that, if this stimulation be carried on perseveringly, the muscle may regain its tone and exert its proper influence in the auditory function. This theory, I think, would help to explain some cases of so-called labyrinthian deafness which Mr Hinton attributed to muscular spasm; for the recovery of hearing is often perfect. The symptoms are often vertigo and paroxysms of tinnitus, the hearing improves during the intervals, and finally, the hearing is restored when the fits of faintness, &c., cease altogether.

"I have no hesitation in saying, therefore, that if the noises in the ears be due to paralysis of these small muscles, relief may almost immediately be obtained by closely pressing the sponges of the battery into the auditory passages, and that still more satisfactory results are obtained by using the probe in the manner I have

already mentioned. I am bound to admit, however, that such results are not always lasting."

Mr Field notices the temporary good effected by electricity, and the unfortunate tendency there is to recurrence of tinnitus. My own experience of electricity in the treatment of aural tinnitus and deafness in catarrhal states does not lead me to speak very highly of its effects, so much so, that of late I do not often resort to it. The papers of Dr Woakes, however, and the experience of Dr Weber Liel, have again converted me, and I intend to systematically employ electricity in a number of cases of progressive deafness and note the results. There is this much to be said in favour of electricity—applied in the manner above described by Dr Woakes—while it can do no harm, and is a remedy most patients will submit to, it can be used by any practitioner, and may be productive of very beneficial results.

CHAPTER XIX.

DEAF-MUTISM AND ARTIFICIAL AIDS TO HEARING.

Any physician who has had a child brought to him for his opinion as to the probabilities for or against the little one's hearing or speaking, and who has seen the look of agony and despair on a mother's face as she hears her worst fears confirmed, must feel the great importance of the subject of the education of deaf children. In a professional point of view, it is of vital importance that all who are consulted in such cases where the hearing is either in great part or entirely lost, and the power of speech absent, should be in a position to advise parents as to the best course to pursue in the training of the child ; and it is also of vast moment, from a social aspect, that deaf-mutes should be so taught as that they may become fairly useful members of society, and be fitted to fill certain positions and earn a livelihood. The few remarks that I make on this subject are intended merely to draw the attention of practitioners generally to the means which can be adopted to remove in some measure the deplorable consequences of this melancholy affliction. Those who are interested in this subject should consult the exhaustive work of Dr Hartmann, which has been recently translated by Dr Cassells of Glasgow (Messrs Baillière, Tindall, & Cox, London). In this work of Dr Hartmann, and in an admirable paper

by Mr Dalby of London, will be found a full description of the two systems by means of which deaf-mutes can be educated, viz., the lip method and dactylology. This latter, or the finger method of speaking by signs, is well understood generally, but it is to the importance of cultivating the former, and the results which have been attained from its practice, that I desire briefly to draw attention. As Dr Turnbull of Philadelphia so well expresses it : “ (1) To excite a greater degree of interest in physicians for the deaf-mute, with an endeavour on their part to prevent deafness, and so diminish the number of deaf-mutes ; (2) To induce a more conscientious study and treatment by physicians of the ears of their patients when the latter are attacked by scarlet or typhoid fever, cerebro-spinal meningitis, or obstruction of the Eustachian tubes as the result of measles, diphtheria, tonsillitis, or syphilis ; (3) To lead physicians to give the systems of instruction pursued in our various institutions for the deaf and dumb a certain amount of study, so as to be able to recommend intelligently to patients, their relatives, or friends, the best method for each individual case ; and that there should be appointed a commissioner, to collect, examine, and classify the deaf and dumb, so that all who are found to possess any degree of hearing, or any remnant of speech, may be taught articulation by the method of Bell, and that those who are unable to profit by this system may be taught the language of signs, natural or acquired.

To Dr Turnbull I am indebted for some most instructive hints on this subject. He thus describes the method of Bell : “ The following is an explanation of the articulate method as I have seen it practised with success

and adapted to teaching the deaf-mute the English language at home, and lip-reading by the sense of sight. The foundation of the system rests upon the fact that articulation is simply a *mechanical* process, the result of certain well-defined positions and movements of the vocal organs, together with a more or less forcible expulsion of air from the lungs. Of the former, the sense of vision renders the deaf-mute cognisant; of the latter, his sense of feeling. All mute children are irritative—the mute child is particularly so—and it is upon the possession of this faculty, *imitation*, that our success in teaching depends. We proceed, then, at the onset by making simple gestures with the arms, the easier gymnastics, in short; then we walk, look in various directions, sit, stand, &c.

“Having thus engaged the attention, place the child directly in front of you, press your upper teeth in a marked manner upon the lower lip, hold a bit of paper in your hand and blow. He sees the paper fly away, is amused, imitates the process, and has given his first letter, *f*. Again, swell your lips out with air, open them quickly, the paper flutters away; this is *p*. Should it be too forcible or not sufficiently so in forming this letter, then imitate a person smoking a pipe; the *puff, puff*, conveys the idea of *p*.

“*T*. Place the tongue between the teeth, force the air out so that it will come in one volume, which is best felt on the back of the pupil’s hand, and *t* is produced.

“*H* is simply the expiration of breath with slightly increased force, the mouth opened naturally.

“*M*. With closed lips the force of the letter *m* is felt by the pupil, who must apply his finger to the side of

his nose ; the vibration indicates the rapid expulsion of air from the lungs.

“ *N*. In the same manner the mute learns the nasal *n*, but is shown the mouth opened slightly, and the tongue pressing against the back of the upper teeth. The six consonants are the ones perhaps most easily learned.

“ *B* is formed like *p*, but is accompanied with sound ; the throat is both seen and felt to dilate, and the expulsion of breath is also less forcible, the puff is gentler.

“ *D* resembles *t*, although it is better in the beginning to teach the pupil to place the point of the tongue back of the upper teeth ; the vocalisation is made apparent as in the case of *b*, also the less decided emission of breath.

“ *V* is simply a vocalised *f*, and, as in the case of *z* and the sub-vocal *th*, the vibration is most sensibly perceived by pressing the palm of the pupil's hand upon the crown of your head.

“ *O*. The vowel *o* is attended with no difficulty. Place the child's hand firmly on your breast that he may feel the vibration, while he sees your mouth assume the shape of the letter produced.

“ *E*. Place the pupil's fist under the angle of the jaw ; the peculiar and forcible vibration there felt he readily produces.

“ *A*. Press the palm of the pupil's hand against the chest, and show him your tongue firmly set against the lower teeth, and somewhat arched ; with this position the letter *a* as in *fate* is produced.

“ *I*. To form *i* open the mouth very wide, and, as you produce sound, close it quickly.

“*U* is made like *o*, except that the lips are nearly closed.

“As soon as the pupil has learned the sounds of the vowels, require him to join a consonant with each in succession, making easy syllables, as *fa, fe, fi, fo, fu*, and reversing the letters, *af, ef, &c.* Next teach him simple words, the names of objects which he can see, or pictures of them which can be shown him, as *map, mat, cap, cat, dog, horse, cow, top, &c.* The next step is to embody these in the form of a sentence, as ‘What is that?’ ‘That is a cat.’ ‘What are those?’ ‘Those are maps.’ The point cannot be too strongly insisted upon that the child should write, as well as speak, everything he learns. This constant practice strengthens the memory and insures steady and permanent progress.”

Professor Bell recommends “articulating rapidly combinations containing *and, but, the*, with *a, an, at, &c.* He had found that senseless exercises also gave great pleasure to deaf children when the syllables were arranged rhythmically.”

“He would therefore recommend teachers of very young deaf children to study such a book as ‘Mother Goose,’ and to set their articulation exercises to the rhythm of the most favourite rhymes.”

Dr Turnbull presses the vital importance of early attention to the education of the deaf-mute. This is indeed the point of greatest practical importance—the early recognition of deafness and the cultivation of any articulate sound that may have been gained before the deafness was acquired. These extracts from Dr Hartmann’s work will prove the importance of this early education.

“ Besides the systematic instruction, medical treatment, as far as this is possible, must, of course, be employed as early as possible; and I could relate to you several cases which have been under my own treatment, in which deaf-mutism was clearly prevented, or arrested and cured, when already partially developed. There is, for instance, at the present moment a girl, still under my care, who during the first few months after birth had a copious discharge from both ears, and only perceived very loud noises. When I saw her for the first time, she was already four years and a few months old, but could, nevertheless, only produce quite inarticulate, barking sounds, which were even unintelligible to her careful mother, so that in reality she was already considered a deaf-mute child. Local treatment of the otorrhœa soon caused it to diminish, and with this decrease of the discharge the child commenced gradually to pay more attention to noises around her, and especially to the words which were spoken close beside her, and also to make attempts to repeat words pronounced for her. These experiments were carefully carried out, and as often as possible the child was made to repeat distinctly words and sentences. In this manner not only was the hardness of hearing lessened, but, after several months, the child could even speak somewhat distinctly; at any rate, its speech was fairly intelligible. Simultaneously the whole nature of the child, who was formerly absolutely unmanageable, was changed, and she became more docile. At last her animal-like wildness, which showed itself in the expression of her face as well as in the continuous squirrel-like mobility of her whole body, disappeared. Without

the local treatment, and without the great and judicious care of her friends, the child would certainly soon have had to be considered a deaf-mute.

“Schmalz* also relates that a child five years old had, after scarlatina, a purulent discharge from both ears two years before it came under treatment, and could only speak a few words very indistinctly. By the treatment, the hearing-power of the child was so much improved that, without instruction, it learned to speak very well.

“Dr Alt† recently reported the cure of a case of acquired deaf-mutism. A boy, who was born with a cleft palate, and who had heard and spoken well, became at the age of two and a-half years, in consequence of scarlatina, so hard of hearing in both ears that he lost his speech, and could only be communicated with by signs. On examination of the boy, when seven years old, there was found great swelling of the mucous membrane of the nose and of the naso-pharyngeal cavity, and a foul-smelling discharge from both ears. After the local treatment of the lining membrane of the tympanic cavity and of the pharynx had improved the hearing on both sides, staphyloraphy was also performed. At the end of the treatment, the boy heard a medium voice on the left at a distance of twenty-five feet, and on the right of twenty feet. He has become very talkative, and attends an ordinary school.

“As a rule, it may be assumed that deafness occurring up to seven years of age will have dumbness as its consequence, while speech is retained if the child be

* “Ueber die Taubst.,” p. 105a.

† “Archiv für Augen-und Ohrenheilk.,” vol. vii. p. 211.

older than that. Still there are cases on record in which children of fourteen and even fifteen years of age have lost their speech by becoming deaf. In such cases, it must, however, always remain doubtful whether deafness alone was the cause of the deaf-mutism."—*Cassells' Translation of Hartmann.*

Mr Dalby says, "that when the children have acquired the power of talking by the dumb alphabet, however perfectly, and go out into the world, they are still deprived of all intercourse with their fellow-creatures. Excepting in those very rare instances where they happen to meet with those who are able to converse in the same way as themselves, the proportion of such persons in ordinary life is so small that for the sake of argument they might almost be put out of the question; or again, on the supposition that a mute could only acquire the power of *reading* from the lips of others, without being able himself to articulate and thus convey his ideas to others, it becomes a question whether he would not, although he had to reply to everything by writing, be a more useful member of a community composed of ordinary speaking individuals, than a mute who could only receive and convey his ideas to those similarly situated as himself, or be dependent for conversation on a chance meeting with some one who had acquired his peculiar language. If such a proposition bears a moment's reflection, it must be apparent how very considerable must be the advantage of that mute who possesses not only the power of receiving information conveyed in the language familiar to all, but also of replying in the same manner. Both of these faculties however are, in the system under consideration, so intimately combined,

that one naturally follows from the other." A very little time since I had a patient brought to me to the hospital who had acquired this habit of speaking. I tested her by several sentences and carrying on conversation with the friends who brought her, and no matter how quickly I spoke, she understood everything I said; she had lost her hearing when a child from scarlatina, and had subsequently lost her power of speech.

"We will assume," says Troltsch,* "that among the 38,489 deaf-mutes in Germany, only 15,000 were not born with the defect, but acquired it subsequently, and we will surely not be far out if we assert that a fifth of those, viz., 3000, if they had received timely and energetic treatment, would not have become deaf-mute, but at the worst hard of hearing to a high degree, so that they might have made use of ordinary private tuition, or could even have attended the public schools, and would at anyrate have retained intelligible speech."

As the principal causes of deaf-mutism, we have consanguineous marriages, heredity naso-pharyngeal troubles, throat and nose affection, catarrh of the middle ear, suppurative otitis from scarlatina, exanthemata, cerebral affections (convulsions), injuries. Typhus is regarded by Hartmann as a potent cause. In the fever hospital in this city I have now treated some thousand cases of severe typhus fever in patients of all ages. I have never known a case of deaf-mutism arise from this disease, since I have been attached to the hospital, a period of ten years.

Deafness during the fever, and permanent partial

* Hartmann, "Deaf-Mutism" (Cassells), p. 107.

deafness of one or two ears is the worst effect, and I can only call to recollection a few cases of complete deafness, but their speech was not affected. Elsewhere I have dwelt on the importance of treating naso-pharyngeal troubles in children ; this is evident, so far as their effect in causing deafness and resulting loss of speech, from the following statement by Hartmann : * “it has been ascertained by *post-mortem* examinations that inflammations of the middle ear are frequently accompanied by inflammation of the labyrinth. While Moos particularly has shown that the membranous labyrinth is infiltrated with small cells, even in cases of slight inflammation, a number of other observers have proved the existence of an accumulation of pus in the labyrinth in cases of severe inflammation of the middle ear.”

“In cases of chronic inflammation of the labyrinth, developed in primary diseases of the ear, or occurring as a consequence of general diseases, hyperæmic swelling, fatty or connective-tissue degeneration, atrophy of the membranous labyrinth, changes in the labyrinthian fluid, and deposits in the same, take place. It has already been pointed out, when speaking of congenital deafness, that naso-pharyngeal catarrhs may be the cause of deafness, and that catarrhs, occurring unnoticed in early childhood, may lead to a deafness which is then mistaken for congenital deafness.

“Statistics of deaf-mutism can give no information as to naso-pharyngeal catarrhs being the cause of acquired deafness. To gain this information, we must examine the deaf-mute children in early infancy, which medical

* *Vide* Cassells' Translation, page 79.

men, who practise aural surgery, will find plenty of opportunity to do. I had occasion myself to examine a number of children who were brought to me by their parents because they did not learn to speak. As the hearing of little children cannot be tested at all, or very imperfectly, I requested the parents to observe whether the children were possessed of the sense of hearing or not. They were told to watch whether the child turned round and became attentive when loud sounds were produced, as by clapping of hands, calling to it, playing upon an organ, ringing a bell, &c. The parents generally convinced themselves that either great or total deafness existed. In several of these cases I found that the children suffered from naso-pharyngeal catarrh, and the hearing could be improved by the removal of the catarrh and a simultaneous treatment of the ear, after which the children rapidly learned to speak. In other cases, however, treatment proved altogether useless."

Dr Turnbull advises special attention to the nose and tongue, any malformation or anomalies, and the encouragement of gymnastic exercises with the tongue and lips. The general deportment and carriage of the child should be attended to, to prevent the awkwardness in gait and manner so often accompanying deaf-mutism. So should the special senses of sight and touch be cultivated. The moral training of deaf-mutes is of special importance. While considerable kindness is shown them, they must be made to know the difference between right and wrong; their habits of order and discipline should be carefully attended to. Foolish indulgence is as bad as excess of severity. Any words uttered before a child has become deaf must be preserved, and the

faculty of speech encouraged in every possible manner. As it happens that a large proportion of mutes do hear sounds, the voice, certain notes, &c., it is evident that an endeavour should be made at all times in children to increase this power. Companionship is indispensable ; it enlivens the spirits, prevents moroseness, helps the cultivation of ideas, brings the child into constant contact with those who hear.

There can be now no doubt that this lip method is the one to adopt in the education of the deaf-mute. In France as yet much progress has not been made, but in Germany the results achieved have been wonderful. Taught thus, and if well instructed, he is, as Dr Hartmann says, "not at all inferior to his perfect fellow-men ; he is able to understand all kinds of writing, and to instruct himself by reading them, he can learn foreign languages, and choose any calling he likes." Dr Cassells, who has perhaps the largest experience of any aurist in the United Kingdom in the education of the deaf-mute, is altogether in favour of the lip method. In the United States, Dr Turnbull tells us "it has been received and adopted in seven of our forty-eight institutions, and with the most gratifying results. I do not find fault with what has been done under the old methods, but rather rejoice that so many thousands of deaf-mutes have received the advantages of an education by means of the sign language, and of articulation taught by the German method. I would also state that the United States have a 'National College' at Washington, where more advanced studies can be pursued, and where young deaf-mutes are graduated with a standing and scholarship not inferior to that achieved by the graduates of

ordinary colleges. This institution bears to others for the deaf and dumb, the same relation that colleges bears to schools and academies. Many of the graduates of this college have received appointments as teachers, while others are editors, authors, and writers, or are found in the various government offices, in the exercise of duties which they are quite capable of performing in an entirely satisfactory manner. In our Centennial Exhibition will be found some admirable pictures executed by deaf-mutes, as well as other products of their pencils and pens. They are also capable handicraftsmen, and are to be found in our shops and factories, as well as in the Industrial Homes founded in this city for their special benefit."

In every instance, especially when the child is sufficiently intelligent, the parents and friends should be cautioned to persevere in coaxing the child to articulate and copy sounds. The hereditary and congenital aspect of mutism are not to be forgotten, and the intermarrying of near relatives of deaf or mute persons should be discountenanced. But decidedly in all cases where such a step can be taken, the child should be early removed to an institution where the teachers are accustomed to take real trouble, and to give the mute the benefit of a skilled training.

"By Bell's system, by means of drawings, &c., a knowledge of the concealed parts of the mouth and throat, which are used in articulation, as also of the movements of the various parts, so that the pupil is thus better able to gain conscious control over them. This method of writing any sounds that the pupils may utter, serves to interest them in the practice of the elements and com-

binations, thus giving them great power over their organs of speech, and obviating the necessity of informing them that a sound is wrong if it is not the one which the teacher wishes to obtain. It is the practice of those who teach this system to write all sounds in the visible speech-symbols, and especially those that are essential in English speech. The symbolising of odd sounds also leads the pupil to think and study about the parts of the mouth that produce them."

It is in this special instruction that the school for the deaf-mute is so superior to the ordinary school. As Dr Turnbull remarks on this matter. Congenital deaf-mutes, attending an ordinary school, may learn to write, or rather to copy, and may perhaps get some idea of numbers; but the teachers of such schools do not know how to teach their pupils' minds, even if they have the time to teach them. As a rule, such children might as well be at play, except that school occupies their time and their thoughts. Another advantage, however, which is gained for the deaf-mute children, is in their mingling as much as possible with those who hear.

"If a child cannot profit by the instruction given in an ordinary school, let him if possible have a private teacher, but not necessarily in his own house, as he is not always subject to the best government there. If he needs stimulating, it may be well to place him in a class with four or five others of a suitable degree of advancement; and if this cannot be done, he may be placed in a school or institution where the instruction is especially adapted to the deaf.

"If children are too deaf to profit by the common

school, and yet have sufficient hearing to have acquired speech through the ear, instructors of the deaf are nearly or quite unanimous in the opinion that they should be taught by articulation and lip-reading. The experience of the teachers would lead them to say, "Let the attempt be made, if possible, to teach *every* deaf child in this way."

Glancing through the table of cases of acquired deafness collected by Hartmann, it is evident that it is of primary importance to attend to the ear and examine it carefully; to remove collections in the external meatus, to clear the tympanic cavity of any pus, mucus, caseous deposits, growth, &c., to keep the naso-pharyngeal tract healthy, to attend to the tonsils and Eustachian tubes, must be the primary duty of the surgeon, with reference to artificial ends. "By speaking," says Turnbull, "or singing, different vowels into one of these aids to hearing (tubes or trumpets), we can determine how much hearing the pupil possesses, and, if he be able to distinguish one vowel from another, a continued use of this mechanical aid may ultimately enable him to utilise audition as an auxiliary to vision. I have known very deaf persons, by the aid of this means alone, to have their hearing so much improved that they could distinguish all ordinary sounds, and by some effort enter into conversation. Another important mechanical aid to persons who are deaf from diseases in which the tympanic membrane is lost, in part or in whole, but in which the inner small bone, the stapes, still remains, or in whose ears the bones have become stiff or ankylosed, is the pellet of cotton moistened and applied near to the bones or against the stapes, so as to bring the parts in closer contact with the

external vibrations, and thus cause the sounds to be transmitted to the auditory nerve."

From Hartmann's table of the results of *post-mortem* examination of deaf-mutes, I have selected these few examples of the changes found in congenital and acquired deafness in the middle and internal ear.

(Bochdalek, *vide* Lincke, p. 594.)—Congenital malformation. On both sides the three semi-circular canals ending as culs-de-sac, without opening into the vestibule, and the auditory nerves much atrophied. In addition, changes in the tympanic cavity, which had probably taken place after birth.

(Moos, *ibid.* vol. vii. p. 448.)—Congenital middle ear. Ankylosis of the ossicula with each other; osseous closure of both fenestræ rotundæ; great abundance of otoliths and numerous colloid globules in the labyrinth.

(Cock, *vide* Toynbee's list.)—Not stated if congenital. All the ossicula absent; membranæ tympanorum partially destroyed; in addition two of the semicircular causes imperfect.

(Schwartz, "Archiv für Ohrenheilkunde," vol. v. p. 296.)—Acquired. Complete absence of the labyrinth; in the left ear a solid osseous mass in its place, in the right ear a mass of fibrous tissue. Tough mucus in both tympanic cavities. It was stated that deafness had set in in consequence of an inflammation of the brain.

(Politzer, communicated to the second Otological Congress, held at Milan in 1880).—Acquired. The cavity of the cochlea and the semicircular canals completely filled with a newly formed osseous mass; the

vestibule considerably narrowed by the same mass. The deafness had set in after acute disease accompanied by fever and convulsions. I have examined all cases of deaf-mutism I have ever seen with the laryngoscope, and in no case have I detected any laryngeal anomaly. With the exception of cases in which the membrane was destroyed by scarlatina, or by ulceration accompanying mastoid disease, or where there has been evidence of chronic catarrh of the tympanum. I have noticed no peculiar condition of the membrane.

Artificial Aids.—There must ever remain a number of patients who consult us for deafness, and for whom we can only advise some artificial aid to assist the hearing. The present state of our knowledge in differentiating the conditions benefited by the various kinds of trumpets, ear-tubes, auricles, audiphones, dentaphones, &c., is anything but satisfactory. Some cases are but little improved by any form of apparatus; there are extensive changes in the ossicles, or the nerve itself is diseased, and the perceptive portion of the ear is destroyed or can only catch certain tones, of high or low pitch, which cannot be conveyed through a trumpet. Still, in a large number of cases the patient is made fairly comfortable by some such means of hearing and carrying on conversation. Also in public buildings such aids are indispensable.

Ear Trumpets.—It is not possible to speak positively of any particular form of ear trumpet, inasmuch as it is purely a matter of experiment with each individual case which one is found to give the best results. I figure here a few of those that I have found most useful in practice. The light, conical, folding trumpet,

made of japanned tin, I have generally ordered of late (figs. 58, 59); it is the best, and most convenient for the pocket. Other small bell-shaped trumpets are shown at figs. 60, 61 (Hawksley, Oxford Street).

Audiphones and Dentaphones.—A few years since my friend Dr J. P. Cassells of Glasgow was kind enough

Fig. 58.



Fig. 59.



Conical Folding Ear Trumpets.

to send me a number of audiphones (sonomittors) with which he had been experimenting, as also the vulcanite folding dentaphone and the dentaphone proper. Dr Cassells tried every kind of wood (save acacia), and came to the conclusion that ash-wood made the best. It is with such an appliance, the simple square fan

of ash, that I have chiefly tried patients myself. I must say that hitherto I have been most unsuccessful in results, nearly all patients preferring and having more distinct hearing with an ear trumpet.

The folding audiphone of Rhodes is simply a fan, made of thin vulcanite, which folds up, one end of which is applied to the teeth, while, with the handle held by the listener, the convex surface is held towards the speaker.

Fig. 60.



Fig. 61.



Bell-shaped Ear Trumpets.

The dentaphone consists of a small vulcanite clip connected with a small circular vulcanite box by a string, somewhat like the ordinary toy telephone. With it I had better results. The proportion of cases in which such aids improve hearing in my experience is very small. Most patients object to the conspicuous nature of the appliance. The experience of several to whom

I have spoken is the same as my own. Dr Knapp ("Archives of Otology," March 1880) gives a similar opinion. Dr Lennox Browne has reported unfavourably of them. Out of a hundred cases, taken indiscriminately, in which the patients could only hear the voice of the speaker when raised very loud, or not further from the ear than two inches, but where the majority did not hear the watch on contact, and only very loud and shouting conversation, three patients were sufficiently improved to make them desire to possess an audiphone. If the vibrations were increased in power it was at the expense of distinctness—the sounds were blurred.

Mr Lennox Browne says:—"The results of the use of the audiphone can only be noted generally. It may be stated briefly that in no instance was the watch, or tuning-fork, or musical sounds heard better than without it. In the case of the watch it was never heard except on contact, even though it could be heard at two inches from the external meatus unaided. The same remark applies to the tuning-fork, except that its vibrations, and also that of musical sounds (a bell, a gong, and a "Punch-caller" being used for the purpose), were stated in more instances to be heard for a longer duration than when placed on the mastoid or vertex. In only eight cases did the patient say he heard more distinctly and louder with audiphone; twenty-seven expressed themselves as hearing a trifle better; whilst in forty cases there was not the least difference. Ten said they heard better, but out of this number only three, when offered one (the instrument), said they would like to use one."

However, the audiphone is well worth a trial in any

case of irremediable deafness. The resonating bar should be held or bitten firmly between the teeth of the patient, hence the dentaphone does not succeed with patients with artificial teeth. The lips should only be kept lightly in contact with the instrument. The degree of concavity suitable for the individual case must be a matter of experiment. The thin wood can be steamed, and then set, in cooling, to the particular curve required.

It is well to state that there is a heavy patent duty on these audiphones of Rhodes, and that they cannot be imitated and *sold* to patients under a penalty.

(See Appendix for description of small ear trumpet of Professor Adam Politzer.)

CHAPTER XX.

MICRO-ORGANISMS IN THE ETIOLOGY OF FURUNCULUS.

Quite recently a series of papers have been published in the "Progrès Medical" * on the etiology of furuncle of the auditory meatus and furunculous inflammation generally. As these papers by Dr Löwenberg have a bearing indirectly on the etiology of other aural affections that may have their origin in malaria, impure air, defective sewage or other sources of contagion and infection, I deem them of sufficient importance to devote some space to their consideration ; the more so as I am convinced of the truth of Dr Löwenberg's view as to the distinct difference there is, etiologically, between the ordinary abscess and the recurrent furunculus of the auditory meatus.† So frequently do we see this latter affection associated with states in which we can readily conceive the multiplication of microspores to occur, and where any contagious elements will find a fertile soil. So also I feel certain that it is in the presence and persistence of such fertilising organisms both in discharges and neglected secretions that we must seek for an explanation of the persistent nature of many chronic aural troubles and the intractable character of the discharges that accompany these. How

* "Le Progrès Medical," July, August, September, 1881.

† Paper by author, "Specialist," November 1, 1881.

often do we not find such attacks assuming almost the character of an epidemic, and which we can account for in no other way than on the theory of M. Pasteur, viz., their spread by means of microbes. M. Pasteur, Dr Löwenberg tells us, has artificially cultivated the micrococci of furunculi in several persons who submitted to his experiments.

M. Hueter attributed the genesis of furuncle to the development of a schizophyte. Dr Löwenberg believes that the origin of the inflammation is to be traced to a micro-organism whether in a germ state or entirely developed. If in the former the necessary surroundings for development are found often in certain trades, as shown by M. Denucé, where the handling of organic substances in a state of decomposition predisposes to the formation of boils, as, for example, in rag manufactories, tanneries, &c. Direct proof of the inherent power of such organisms to create abscesses may be had by injecting liquids containing them under the skin of rabbits when the same organisms will be found in the resulting abscesses. It would appear that this process of inoculation modifies the inflammation inasmuch as it is more easily subdued by treatment, and is not so severe. The prevalence of such inflammations in the spring and autumn is widely known. Miquel and Rindfleisch have shown that rains favour the development of musty parasitical fungi, but are destructive to the growth of schizophytes. Now spring and autumn are frequently ushered in with heavy rains. Dr Löwenberg surmises that this susceptibility may arise from the secondary infection of drinking or washing water. It may also be that during the damp seasons many

persons are debilitated and more susceptible. In this way we may perhaps account for the occurrence of boils in cases of diabetes. There is a general want of vitality that is favourable to the invasion of such organisms. The skin itself is unhealthy, and is ready and prone to receive the poison from without, or by a species of auto-infection, from a pre-existing furuncle. The sugar itself may by its presence in the cutaneous secretion and in the skin assist in the multiplication of the germs. The occurrence of multiple boils in the neighbourhood of the first, Dr Löwenberg explains by the discharge of pus and the direct transmission thereby of the microspore; patients' fingers, pieces of dressing, &c., may be the means of infecting more remote parts. In diabetes Dr Löwenberg points out we have a temperature favourable to the development of these organisms. The special danger of recurrent furunculous inflammation of the ear becomes more obvious if we regard this view as the correct one of the etiology of the affection.

The power of autogenetic infection present in the furunculus and the chances of the multiplication of the microspores or their penetration into the general circulation either through secondary involvement of the walls of the vessels or direct penetration (Klebs) explains the occasional occurrence of putrid fever and the formation of thrombus and remote abscesses after furunculus. In referring to the diagnosis of furunculus from abscess Dr Löwenberg insists that inspection alone will not enable us to come to any conclusion. He would rather rely on the multiplication of the microbe in an aqueous solution of Liebig's extract of meat

or ordinary beef tea. Dr Löwenberg commences treatment by cutting the furuncle if it has not broken itself, he uses, though we think this unnecessary, an anæsthetic, in order to freely follow the duct of the follicle. Immediately after he applies a solution of boracic acid or in fine powder (M. Berzold). Lately he uses an alcoholic solution. I have, in a recent case of a young lady attacked with violent furunculous inflammation, applied this treatment with marked success. These facts and many other considerations force on us the value of antiseptic treatment in the management of inflammatory diseases of the external and middle ear, so frequently and strongly insisted on elsewhere throughout this work, and not indeed in affections of the ear alone, but in those of the naso-pharynx and throat.

APPENDIX.

Ear Spout.—The spout that I use in syringing I had from Messrs Matthews. It is the lightest and most convenient form I know of; a light spring in the shape of a head band secures it to the head, and there is no necessity for an assistant.

Boxing the Ear and Blows on the Ear.—Every medical man should discountenance the habit, unfortunately only too prevalent, of boxing the ears of children. More than one fatal case has occurred from the injuries thus inflicted—rupture of the drum-head, bleeding into the middle ear, otitis media, extension of the mischief to the brain have followed. Quite recently I had a case, a policeman, who in a scuffle received a blow of the fist over the ear; there was some hæmorrhage at the time. I saw him subsequently; there was a rent in the membrane, and this lesion was attended with complete deafness and the most distressing tinnitus. Not alone should slapping children on the ear be prohibited, but a kindred practice nearly as injurious, namely, pulling the auricle. Not long since I had a case where inflammation of the auditory canal followed a severe “pulling of the ear.”

Dr Cassells, in a paper published this year,* quotes these two cases—

A. L., age 13. A few weeks ago she got several blows on her right ear from the schoolmaster. On inspection the membrana tympani on right side was ruptured in its anterior quadrant, acute muco-tympanitis following. Treatment: Antiseptic, and rest by excluding all sound. Result: Dismissed cured in ten days.

R. M'D., age 6. Four years ago right ear began to run, and has continued to do so more or less since then, after having his ear pulled at school. On examination, it was seen that the right membrana tympani had been ruptured. This case was one of traumatic rupture of membrana tympani, followed by chronic muco-tympanitis. Result: Patient was dismissed cured in four weeks, hearing quite well.

Leiter's Temperature Regulator.—By means of this regulator, special forms of which can be obtained for the ear, warm or tepid applications at any temperature can be maintained. These new regulators can be had of Messrs Khnone & Seseman. They will be found useful in relieving the pain of inflammation either in the auditory meatus or the tympanic cavity.

Insects in the Meatus.—Should an insect find its way into the meatus, the best thing to do is to pour in a little warm oil or glycerine, with some alkali, as potash or soda, so as to suffocate it, and then it can be washed out with a syringe.

“Specialist,” April 1, 1881.

Application of Leeches.—In applying leeches it will be found far more efficacious to apply one or two leeches, with a leech-glass inside the concha or tragus. If more have to be used, they should be applied over the mastoid, close to the ear. The artificial leech is an admirable and rapid method of depleting.

Erysipelas of the Auricle.—Sometimes this affection assumes formidable proportions, occurring either in connection with erysipelas of the scalp or as a complication of some other aural trouble, rarely ideopathically. I have just had a case of erysipelas of both auricles occurring in connection with a slight ecthymatous attack of the head and face. First one auricle was attacked, and then the other, finally the inflammation spread to the scalp. The treatment does not differ from that of erysipelas elsewhere. The deafness that accompanies the disease disappears on the subsidence of the swelling. The meatus must be kept as clear as possible; some fine powder of equal parts of starch flour and oxide of zinc, kept to the part, with gauze over the skin, or fine muslin; or, if it be preferred, an application of equal parts of mild mercurial ointment and vaseline. The general health should be well sustained, and tincture of iron administered.

Alcoholic Treatment of Polypi (Politzer).—Professor Politzer first evacuates the pus and cleanses the parts with warm water, and further dries them with cotton wool. He then pours in the alcohol off a spoon into the meatus slightly warm. It may be diluted with water if there is great pain. The instillation is

repeated at first, three times in the day, reduced to one. Mucus and albumen are coagulated, and the granulations and polypi grow pale, and later still the contents of the vessels in the superficial layers, and this results in contraction. Professor Politzer recommends the use of alcohol in the remains of polypi that we can not extract, granulations, proliferation of the mucous membrane of the middle ear, polypi that cannot be extracted from the meatus, in nervous persons ("Weiner Med. Wochenschrift"), "Specialist," Oct. 1, 1881.

Small Ear Trumpet of Politzer.—Professor Politzer has lately devised a very small ear trumpet to be worn in the ear. In a paper (Ein Kleiner Instrument für Schwerhörige) published in the "Wiener Med. Wochenschrift," No. 18, 1881, Professor Politzer describes the advantages of this small tube. Having noticed the failure hitherto to construct small instruments which would not be conspicuous, and yet increase the hearing power, rather, on the contrary, were they followed by a diminution in distinctness of sounds on account of the narrowing of the auditory passage. Professor Politzer dwells on the importance (Schneider) of the concha in gathering up sound waves and reflecting them back, and also of the tragus, forming, with the concha, a chamber for the collection of the sound waves. The greater the area of the space formed by the concha and tragus the greater the perception of sound. Some of the sound waves are necessarily lost. Professor Politzer's instrument is devised to diminish as much as possible the loss of the sound waves during their reflection, and to conduct them into the auditory

meatus. The instrument is here represented. The narrow part fits into the auditory meatus and the wide portion is turned towards the concha. There are



three different sizes. The larger measuring in length $2\frac{1}{2}$ cm.; at its outer opening it has a diameter of 12 mm., and at the inner aperture it has a diameter of 5 mm. It

is shaped like a miniature hunting trumpet, and is made of vulcanised caoutchouc. Professor Politzer had tried this little trumpet on 115 deaf persons. The deafer the person the less successful the application of the trumpet. Professor Politzer gives the exact results arrived at, but the general conclusion is that there was a fairly successful issue in a large number of cases. His own trials were made in a comparatively small room. Two gentlemen who, in the front rows of the Castle Theatre, could only partly understand what was said on the stage, were able to hear everything with the instrument; and a lady who could only confusedly hear in the middle rows the airs when played, could distinctly hear every tune with the little trumpet. I am indebted to Mr Cresswell Baber for one of these instruments. Dr Pius of Vienna has kindly sent me some to try. These have no opening in the narrow end as represented in the drawing. I to-day placed two of these trumpets in the ears of a deaf patient, who hears conversation with difficulty. The improvement was so great that he wanted not to return them.

ABBREVIATED TABLE OF DISEASES.

The subjoined brief Table of Diseases I have arranged from our *Hospital* Register of 1500 cases treated, as they have been classified by my assistants (1878).

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ERRATA.

- Page 118, line 22, for "hygeometric" read "hygrometric."
 ,, 240, ,, 9, 18, for "Siegel" read "Sieglié."
 ,, 243, ,, 15, for "Burnell" read "Burnett."
 ,, 249, ,, 30, for "eucolyptus" read "eucalyptus."
 ,, 271, ,, 18, for "perforator" read "perforation."
 ,, 315, ,, 23, for "otilitis" read "otitis."



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